Diphtheria.

DIPTHERIA:

By DAVID WOOSTER, M. D.

SAN FRANCISCO, 1859.

AN ESSAY

ON DIPHTHERIA,

WITH CASES;

BY D. WOOSTER, M. D.

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1. For the last few years, many notices of a disease in which false membrane appears in the fauces, attended with high fever, rapid pulse, etc., have appeared in the various medical journals, particularly in France, and for the last year in England and California. The *Pacific Medical and Surgical Journal* has already published two carefully prepared papers on this disease, one by Dr. Blake and the other by Dr. Fourgeaud, of Sacramento.

2. Bretonneau called a disease of the fauces, attended with an exudation resembling the pseudo-membrane in this disease, *Diphtherite of the Mucous Membrane*. Since then every disease of the throat attended with exudation has been called *Diphtherite*, *Diphtheria* or *Diphtheritis*.

3. Now as names are designed to represent ideas, it will be well to clearly understand this name.

There is a Greek word *deuo*, which means to "pour out," from which is derived a second verb *depho*, which signifies to knead and work leather, and from the latter is derived *dipthera*, which strictly signifies a yet moist hide or skin, stripped from an animal; from the last mentioned word comes *diphtherias* or *diphtheritees*, which signifies one clothed in skins, and hence some doubting the inflammatory nature of the disease, have called it *diphtheria*, or in the French *diphtherie*, to indicate simply the presence of the extra or false skin or membrane. But others, believing in the inflammatory nature of the affection after Bretonneau, have sought another Greek root to add to the first, by which to express their idea, and have found *io* or *eo*, to go, from which are derived *eimi* (Gr.) to travel, and *ito* (L.) to go again, from which come *itees* (Gr.) meaning violent, bold, &c., or an imaginary Latin word, *itis*, signifying inflammation. By adding this *itees or itis* to diptheria, we get diphthera-itis, contracted into *diptheritis*, or *diptherite*, which mean a false, or poured out, or exuded skin, or membrane, itself in a state of inflammation; but those who use the word mean that the false membrane originates from a subjacent inflammatory and exudative process.

I shall use indiscriminately *diphtheritis*, *diphtherite*, *or diphtherie*, or diphtheritic sore throat, or pseudo-membraneous sore throat, or perhaps *angina diphtheritica maligna*, after Trousseau. This latter name, though excessively unwieldly, is perhaps the most expressive of the true character of the malady. But they are all employed to express the same idea, and are sufficiently significative for all practical purposes.

4. If the question were asked me, What is diphtheria? I should answer, It is a condition of the system in which there is a contamination of the blood by some unknown *substance*, and in which there appear characteristics dis-

similar from those of every other known disease, and sufficiently uniform, constant and manifest, to make it recognizable upon observation.

5. A physician who has never seen a genuine case, might suppose he had treated many, but when once a veritable case comes under his care, all such illusions are dissipated, and he frankly confesses, to himself, at least, that it is an unique, and hitherto rare affection.*

6. Diphtheritis, "diphtheritis," exclaims the classical physician; why it is a Greek word, and signifies something enveloped in a covering not its own. It is the formation of adventitious skin or membrane upon the natural one.

This is what the *word* means. But this is not all that is meant by it.

For example, there is one kind of false membrane that is amorphous, muco-purulent, a sort of bastard false membrane, yet secreted from and covering the true diseased mucous membrane, like the genuine albumino-fibrous *diphtheritees*, which is the sign of a profound alteration of the blood, by which hundreds of children are dying, and from which as few recover as from any plague or pestilence ever known.

7. That there shall be no doubt in the mind of those who shall take the trouble to read this paper, of the peculiarity of this disease, of its dissimilarity to Croup, and to the *diphtherite* of Bretonneau, or to putrid sore throat, or *cngina gangrenosa*, I shall attempt to present these as they are recognized by the medical classics, so that their antithesis shall be conspicuous.

8. We will let Bretonneau describe his *diphtherite* in his own words, as literally as we can put them into English.

At the beginning of the disease there is perceived a circumscribed redness, which is covered with semi-transparent coagulated mucous. This first *couche*, thin, supple and porous, may be still elevated by portions of unaltered mucous membrane, in such a manner as to form vessicles.

[Who ever saw any vessicles on the *diphthera* of our diphtheritis? But to our author.]

Of en, in a few hours, the *red* patches visibly extend, step by step, through continuity or contact, in the manner of a liquid poured on a plain surface, or which runs by *striae* into one channel. The concretion becomes opaque, white and thick; it assumes a membranous consistence. At this period it is easily detached, and adheres to the mucous membrane only by very delicate prolongations of a concrete matter which penetrates into the muciparous follicles.

[It is precisely at this incipient stage that our *diphthera* is not easily removed, and adheres most tenaciously. The patch or *tache* of our *diphthera*, in the first stage is inseparable, except by violence, from the subjacent membrane. The edges of this patch so insensibly shade off into the circumscribing natural membrane, that it is impossible to say, rigorously, where the false membrane is limited by the true. The centre of our diphtheritic patch

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* A practitioner in the neighborhood of Tunbridge Wells, stated he had had 400 cases, all of which had terminated favorably.—*Lon. Lancet, March*, 1859.

A physician in this city stated he had had fifty cases, and had not lost the first one. Dr. Bynum, of Cache Creek, had 16 cases, and did not lose one!—*Pac. Med. and Surg. Jour. Aug.* '58.

These gentlemen were beyond question sincere. But the solution of the *infinite* discrepancy in their success and that of the best physicians in Europe, and others of average ability in America, is, that they had not had a single case; for if they had one, they could not have mistaken the second, and that in 400, or 50, or 16 cases, exactly 400, or 50, or 16, get well, is purely in the last degree incredible.

M. Trousseau gives an example where a physician reports 60 cases of this disease in his own practice, and that exactly 60 cases *died*. And Trousseau highly eulogizes his disinterested candor, and does not censure him in the least for his want of success.

is whitish or grayish, and opaque, while its periphery becomes more and more translucent until it is lost entirely in the natural tissue.]

Our author continues:

"The surface which it covers is usually of a slightly red tint, sown with points of a deeper red color; this tint is more vivid at the periphery of the *taches*. If the false membrane be detached, and leave exposed the mucous surface, the redness which appeared subdued under the concretion, redevelopes, blood transudes through the deep red points, the concretion reappears, and becomes more and more adherent upon the points first invaded; it often acquires a thickness of several lines, and passes from a yellowish white to yellow, grey, and finally to black. At the same time the blood transudes with more facility and constitutes those *stillicida* which have been generally remarked by authors."

[There is none of this stillicidia in our diphtheritis; on the contrary, the parts covered with exudation do not bleed except when violence is used to tare off or scrape off the false membrane, and then the bleeding stops with remarkable promptitude, and does not occur again except on the repetition of the violence. Our false membrane never becomes black; indeed it is paler after than before death.]

"Now, the alteration" continues the illustrious physician, "of the organic surfaces is more apparent than at the beginning; often portions of concrete matter are effused (*epanchees*) into the substance itself of the mucous membrane; there is observed also a slight erosion, and sometimes ecchymosis in points, which, by their situation, are exposed to friction, or from which the avulsion of the false *eschars* has been attempted; it is especially about this period that the concretions which are corrupted exhale an infectious odor. If the concretions are circumscribed, the œdematous swelling of the surrounding cellular tissue makes the former appear depressed, and judging from this appearance only, we might be tempted to believe we had under observation a foul (*sordide*) ulcer, with considerable loss of substance. If, on the contrary, they are extended over considerable surface, they become partially detatched, and hang in *lambeaux* more or less putrefied, and simulate the last stage of sphacelus; but when we open the body of those who, after several days of illness have succumbed to tracheal diphtherite, we shall find in the air passages all the shades of this inflammation from its first degree, as shown on the parts just invaded, up to that which has by its deceptive appearance, led us, for a moment, to dread the supervention of gangrene. * * * * * * * * *

Gangrene was not present a single time, in fifty cadavres examined by me.

The salient character of the pellicular phlegmasiæ is the tendency to progression towards the larynx and trachea; it is this tendency which gives to them their dangerous character, especially in epidemics, as the first that occurred, so well developed by M. Bretonneau.—*Dictionaire de Medecine, Art. Diphtherite.*

[We submit that that this is only a family resemblance, but not an identity, scarcely a similarity.]

9. We now give M. Duche's description of the Diphtheritis which has for the last few years proved so fatal, as it occurred in the department de l'Yonne, in France, in 1858.

The principal features of this epidemic are Cephalalgia, fever more or less intense, pain in the fauces.

Upon examining the mouth, the tonsils are found swollen and red, and on the surface of one, sometimes both at the same time, there is a *white* patch of variable dimensions. These patches quickly enlarge, reach the velum palati, and uvula, which latter at times becomes enormously enlarged; later they invade the posterior walls of the pharynx and descend gradually into the larynx and bronchia, and *even into the œsophagus and digestive organs.*

Then different accidents are manifested according to the region invaded.

The first period, which may be called pharyngial, is characterized by a painful sensation, and the ejection from the mouth of abundant sputa, mixed with blood and false membrane.

[Of course M. Duche, is not speaking of sputa in infants. In the four or five cases we have seen, infants and children, there was no blood in the mucous which came from the mouth, either by spitting or vomiting.]

The invasion of the larynx is marked by all the signs of croup, and asphyxia rapidly terminates the scene of agony. On the contrary, *when the larynx escapes*, then there is an apparent calm which deceives the most experienced eyes. Then there is a little vomiting of glary matter, great thirst, absence of pain, but soon complete prostration; pulse insensible, absence of urine during *four or five days*, (!) and death by syncope.

[We have noticed remarkable diminution of urine, but not total suspension even for 24 hours. M. Duche does not say whether the "absence of urine" was due to its retention in the bladder, or to deficiency of secretion; doubtless the latter is meant, for if it were merely retained, he would certainly have employed a catheter oftener than once in "four or five days."]

It is generally easy, he continues, by aid of curved forceps, to seize and *tear* away the membraneous exudations when they cover only the tonsils, uvula or pharynx. The mucous membrane thus denuded is *livid and bloody*; and notwithstanding the most energetic cauterization, a few hours suffice for the reappearance of new morbid formations, like the first.

Gangrene of the pharynx often terminates the disease in a sudden manner, and we are warned of this fatal issue by the fetor of the breath and of substances ejected from the mouth." *Gaz. des Hop.* No. 36, 1858.

In a subsequent letter, (*Ib.* No. 42, '58.) in reply to Loisseau, (the hero of catheterization of the larynx), M. Duche says, "I have already summarily enumerated the most salient features of this disease. These I will not dwell upon. What I wish to demonstrate is the peculiar nature of this affection, the "medical constitution, "which predominates at the present time."

In No. 133, of the same, M. Duche says:—

"What is the fact most evident to all practitioners, who have observed the epidemics of *angina couenneuse?* It is first the mediate contagion, or the infection by the respiratory passages or otherwise; in a word it is a manner of communication perfectly identical with that of variola, rubiola, scarlatina, or even of typhoid fever. No one can deny the fatal influence of a focus of epidemic *angina couenneuse*, upon those who are exposed to its emanations. There is, then, in the subjects of *diphtherite* a primary infection. There is consequently a period of incubation, which varies according to the individuals infected. There is afterwards the period of eruption, which is marked by the appearance of the *pathognomonic patches* upon the tonsils.* This erruption is discrete or confluent, according as it is limited to the tonsils, or to the whole of the fauces and the respiratory passages.

Then comes the period of absorption or secondary infection, such as is also observed in variola, and finally the period of desquammation, or the fall of the false membranes, if the disease has been mild enough to permit the accomplishment of this period." * * * * *

It is certain that the primary infection takes place by means of specific germs, which emanate from the morbid products developed in the affected individuals. The diphtheritic germ or miasm, as surely produces diphtheritis as variolic miasm engenders variola." * * * *

"The whole gravity of diphtheritis consists in its confluence, and in the secondary infection, since then the patients die either by croup, or by gen-

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* The reader should not rely too implicitly on these *pathognomonic patches on the tonsils*, for they do not always appear there first. MM. See and Trousseau have seen them first in other places. See for example in the nose. M. Porry says (sec. 11) it more frequently invades the uvula velum, pharynx, &c., than the tonsil.

eral poisoning. I do not speak of the infinite complications which may farther aggravate the condition of the patient. These complications are the same as those which accompany the ordinary eruptive diseases.

As to the peculiar affinity of the pseudo-membrane for the tonsil, I believe that this mode of eruption may be regarded as pathognomonic of diphtheritis, (*angina couenneuse*) the same as the primary invasion of the larynx and trachea by the diphtherite is the characteristic origin of croup properly so called.

These diseases are two varieties of the same specific affection.

[Here we have a definite enunciation without any equivocation, namely, that croup and diptheritis depend on the same specific affection.]

The determination of the primary invasion upon this or that organ is under the particular influence which is vulgarly called *medical constitution.*

At the beginning of this century croup was confounded with diphtheritis; and croup has this particularity, that the membranous productions which characterize it, follow specially the continuity of the mucous lining of the air passages, and are rarely developed upon the tonsils or pharynx. In diphtheritis, on the contrary, croup is not necessarily the consequence of the affection of the pharynx; it happens only by confluence of the disease, and by its descending progression.

The determining cause of these morbid affections of the mucuous membrane, which have multiplied in a frightful manner within a few years, has been sought.

Dr. Vernhes (de Beziers) thinks that the relative rarity of contagious cutaneous exanthemata, should be taken into consideration. This is a serious observation. This disappearance of variola, rubeola and scarlatina in a great many localities may cause an unlooked for reaction upon the mucous tissue, which is too often security for the skin, and has to pay penalty for the immunity of its associate.

It is worth the inquiry, if human intervention has not much to do with this increase of diphtheritic disease.

But there still remains the question of the specific nature of the pseudo-membranous virus. This virus exists. What is it? We are no more able to answer than for variola, measles, scarlatina, or any other contageous disease.

[We see that Duche, in 1858, has described an affection of the same family as that described so graphically by Bretonneau, in 1826. But Duche's disease, though near of kin, is still immeasurably more powerful than its ancestor.]

10. We still continue the description of the masters:

M. Bouchut, of the Hospital of *Enfants Trouves*, (Paris), has studied it thoroughly, and described it under many aspects. I translate from the French.*

In the opinion of M. Bretonneau, the *phlegmasies couenneuses*, which are erroneously called "diphtheritis," are diseases primarily general, diathesic, and more or less toxic, according to subjects; possibly remaining a long time stationary and finally disappearing, but ordinarily infecting the system mortally. This is an error which should be combatted, and that it is a greatly exaggerated prognosis of *diphtheria*, is confirmed by all clinic observation.

Angina Couenneuse is a special phlegmasia, which is at first in no wise diathesic, any more than anthrax, hospital gangrene, chancre, vacine pustule, inocculation of variola, an extensive suppurating surface, etc.

It is a specific local inflammation, at first limited to a single tissue, secreting a morbid product susceptible of poisoning the organism.

In the same manner pus of extensive solutions of continuity, or of large

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* *Gaz. des Hopitaux*, 1858, p. 506.

wounds, engenders pus, and becomes infectious, and causes hectic fever. The same as the phlegmasia of anthrax produces new carbuncles upon various portions of the body; the same as epithelium, accumulated in a tissue, becomes, in time, the source of an epithelial diathesis, with poisoning of the economy; just as an accidental cartilaginous production, at first local, begets a chondroid diathesis; the same as muco-pus, and the fibrine secreted in special conditions by an ulcerated mucous surface, constitute at first a local lesion, which often becomes the point of departure for a *general infection* of the organism. The virus of chancre, inoculated variolic pustule, rabid or poisonous wounds, etc., come in the same category. They are local lesions, developing a vitiated secretion, in which there exists an infecting substance.

The pus of chancre, of glanders, or of variola, are the same except this unknown ferment which we have never been able to detect, which we call *virus*, that is, the infecting substance, element or product. It is only later, or where time has been allowed for absorption to take place, that poisoning occurs. Remove in time, the primitive local lesion, and the infecting germ, destroyed in its place, will have no effect upon the organism. This is what is done daily in chancre, bites of rabid or diseased animals, hospital gangrene, etc.

Better enlightened upon the nature of *angina couenneuse, limited to the tonsils*, these glands may be excised at the commencement, and the disease be destroyed upon the spot: the proof that it is thus is that the affection does not reappear upon the cut surface, which it infallibly should do, if the disease were general."

[I reserve the discussion on the ablation of the tonsils in diphtherite, till I come to the treatment. The corrollary from the foregoing remarks of Bouchut, is inevitable.

He believes either, that the germ of the disease lodges primarily upon the tonsil, or some other point, and from that centre proceeds to infect the system, or that the contagious germ is begotten by a primary inflammation, and first manifests itself in a patch of *diphthera*, or false membrane, upon some portion of the true mucous membrane, and that the whole poison is contained in the exudation at first, or at some particular time, and that if this matrix of the poison be removed, the system is free until the same inflammatory process has generated, or engendered, to use his own word, more of the specific virus. Laconized, his opinion of diphtherite reads thus:

Angina couenneuse, is a local disease, which may become general. It is produced by a specific germ or virus, lodged upon a mucous membrane, which infects the system in a certain variable period, if not removed; or its general infecting principle is generated, *de novo*, by an inflammation, and its moment of generation is signalized by the appearance of the pseudo-membrane.

If I have any clear appreciation of logic, this is a necessary inference from the argument of Bouchut, and the justice must be done him, to say, that his treatment is a fatal sequence of his diagnosis. I do not intimate whether he is right or wrong, but merely exhibit him as he presents himself.]

11. M. Porry says it is a special iosic-phlegmasia, evident by its peculiar attack, its gradual extension, and above all by its contagious nature, as unfortunately too frequently demonstrated in the case of physicians who have died of the identical affection they struggled to cure in another. Again, he says, in opposing the ablation of the tonsils: It is easily conceived that if the disease were limited to the tonsils, their removal would be correct; but this absolute localization of *plastic pharyngitis*, (another name of the Proteus) is scarcely supposable, and moreover it is the pharynx, the velum palati, the uvula, and not the tonsils, on which the exudation most frequently appears.

12. M. See says the false membrane frequently appears in the nose at the

beginning, and asks, satirically, if M. Buchut would ablate the nose also' because it contains the localization of the disease.

13. If there exist an inflammation of such nature as to generate *de novo* a contagious substance, what guaranty have we, that although removed as soon as manifested in the exudation *tache*, it will not reappear in some other place? But Bouchut compares it to the poison of reptiles, syphilis, etc.' which is evidently applied locally, while this virus, if coming from without, can only manifest itself after it has entered and contaminated the circulation, and it is after this that this mute appeal of nature to the aid of art is made, this sign set in the fauces, of the total contamination of the vital fluid.*

14. Trousseau's Opinion of Diphtherite. In the course of his report on tubing the larynx, read before the Imperial Academy of Medicine, on the 2nd of November, 1858, M. Trousseau makes the following remark:

Those of us who for 25 years have followed the epidemics of *diphtherie* which have stricken the capitol, may satisfy ourselves that the malady has, especially during the last twelve or thirteen years, not only considerably extended, but assumed a much graver form. Up to about 1846, *diphtherie* scarcely appeared in the epidemic form, and the cases of it which were observed in the city, (Paris) presented all the characters so well described by Bretonneau in his treatise, so clearly pointed out by Guersant, in the *Dictionaire de Medicine*, where this meritorious practitioner confirms in every particular, what the illustrious physician of Tours had seen. But already in the year preceding his own death, Guersant had seen this *grave form of the disease*, which a little later carried away one of his children, and which, more than ever in these last years, has appeared in Paris as well as in some of the departments, with a violence which forcibly reminds us of the epidemics of the sixteenth century.

The *Diphtherite* described by Bretonneau, generally commenced in the pharynx, and there remained the *longer* in proportion to the youth of the child, giving rise usually to *little fever*, scarcely in any wise affecting the rest of the economy, and was propagated to the larynx, thus constituting croup. But within the last decade, in place of this affection, *relatively of little severity*, there has appeared another, in which hitherto *all the resources of art have been almost unavailing.*

The pharynx, it is true, is most commonly first attacked: but in a little time, the disease extends to the nares, to the nasal duct, and sometimes to the internal surface of the eyelids, and at the same time ataxo-adynamic symptoms become manifest, the pulse becomes excessively frequent, the cervical glands greatly enlarge, and frequently 48 hours after the attack, the patient dies, *without the larynx having been sufficiently affected to suggest the idea of croup.* It appears as though a *poison* had been introduced into the system, by which the latter had been intimately and rapidly modified. If, perchance, the disease be a little less violent, and an energetic treatment shall have succeded in triumphing over the first symptoms, convalescence is slow, the blood remains profoundly altered, the tissues discolored, paralytic phenomena appear in different parts, and sometimes last many months, showing to what a degree the functions of the nervous system have been impaired by the morbid poison."

Trousseau and Guersant were both pupils of Bretonneau, and if they, particularly the former, yield the point of identity in the diphtherite of the last ten years, and that of 1825, there is little hope of any one else being able to maintain it successfully.

15. But in the last edition of Watson's Practice of Physic, published as late as September, 1857, and republished, edited by Dr. Condie, we find this

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* It is inconceivable that the germ of the affection should be drawn in with the air, or taken in with the food, and stop precisely on a tonsil, and then produce the inflammation which should excite its own germination and propagation.

remarkable description of diphtheritis in the text, and no commentary by the American editor:

"A severe inflammatory disorder of the throat, much more common in some parts of France than it is in this country, and named by M. Bretonneau, of Tours, who first fully described it, *diphtheritis*—is regarded by Dr. West as a variety of croup. Some analogy with that disease it certainly has; but the points of difference are stronger and more essential. It resembles croup, inasmuch as it leads to the production of an adventitious membrane upon a mucous surface. It differs in the position of that membrane, which is seldom formed in the trachea. The affection of the windpipe, when it occurs at all, is secondary: so that the term cynanche trachealis would be quite inappropriate. The parts first and chiefly concerned are the fauces. A whitish or ash-colored membrane forms upon the pharynx and tonsils, and extends forwards to the soft palate, and into the nostrils, and backwards into the œsophagus, sometimes into the larynx, but seldom into the trachea. Around it, between its fissures, and in spots from which it has been detached, the mucous membrane is seen to be of a deep red, and sometimes of a purplish or claret color. The submaxillary and cervical glands are liable to swell, the neck in front becomes full and œdematous, and an acrid discharge from the nose is commonly present.

"This very formidable complaint, of which I have not seen more than two or three examples, proves fatal generally by the extension of the inflammation into the air passages. It is attended by fever, commonly of a low type. In Picardy and Touraine it would seem to be endemic; occurring sometimes sporadically, sometimes with an epidemic prevalence, and not without suspicion of contagious properties. In 1855 and 1856 it was rife and deadly in Boulogne. Dr. West has met with the disorder occasionally as an idiopathic affection, but much more frequently as 'a most dangerous complication of some other disease, almost always of measles.' It seldom begins until the eruption of measles is on the decline, or the process of desquamation has commenced. There is generally so great a depression of the vital powers, as to contra-indicate the employment of active antiphlogistic treatment. The two remedial measures upon which Dr. West mainly relies, are the careful and repeated sponging of the fauces with a strong solution of lunar caustic, (a scruple to the ounce of distilled water,) and the exhibition of tartar emetic in the same manner as in cynanche trachealis. Mercury, by the mouth, if the state of the bowels permit, or by inunction—and an early support by nourishing broths and by bark, or wine—form also important parts of the treatment.

"The comparative freedom of the windpipe would encourage a trial of tracheotomy in these cases, when life seemed in jeopardy from impeded respiration; but the morbid condition of the blood, and the resulting character of the attendant fever, forbid the hope of such success from that mechanical remedy as it might otherwise promise.

"This disease has recently (November, 1855,) proved fatal in the family of an esteemed member of the council of this College. The patient, a young man about 17 years of age, was carried off after less than four days of illness. His symptoms, as described to me by my friend Dr. Burrows, were precisely such as I just now enumerated. The respiration became at last laborious, and tracheotomy was performed by Mr. Stanley—but in vain. In the larynx and trachea there was no trace of that sort of coriaceous membrane which covered the tonsils, velum palati, and fauces generally. I mention the case for the purpose of recording that, besides and beyond the usual appearances already specified, the centre of the swollen left tonsil was occupied by a sloughy abscess, while the right contained about a drachm of genuine pus. At no time during the progress of the disorder was any kind of lowering treatment admissible."

The first paragraph very well describes *our diphtheritis*, but not that of

Bretonneau, as will be readily seen by comparing the two descriptions; and Dr. Watson says he is speaking of the same disease.

Bretonneau says nothing of the coryza as a marked symptom of the disease he saw, while it is one of most fatal import in the present affection. The cervical glands were *not* generally swollen, nor the neck œdematous in the epidemic of 1845, and death *never* occurred until the disease had reached the larynx, causing croup.

The patients in that diphtheritis *all* died of the secondary disease—croup. In our diphtheritis, the air passages are frequently not affected, and the patients generally die without croup or its symptoms.

Dr. Watson says "this formidable complaint proves fatal generally by the extension of the inflammation into the air passages." And yet in the paragraph immediately preceeding, he says it *seldom* extends into the air passages, and *sometimes* into the larynx." Therefore "this formidable complaint" proves fatal only "seldom," or at most only "sometimes."

In our diphtheritis there is never any abscess in or about the tonsils, there is never any sloughing with loss of substance, as in the Syriac ulcer, or gangrenous sore-throat. In this case of Dr. Watson, there is "genuine pus" in one tonsil, and a "sloughy abscess" in the other, either of which exclude it from the diseases I am speaking of.

Dr. Watson of course, would recognize in a moment, that these two paragraphs are incompatible with each other, but still if his work had a hundred such incompatibilities, we should consider it the most readable work on the practice of medicine in any language. Evidently the learned professor has not taken the time to ascertain the marked distinctive characteristics in the *diphtheria* of the present, and that of 1825. This is the more unfortunate to the junior members of the profession, in consequence of the lateness of the edition, the unsurpassed fame of the author, and the distinguished reputation of his American editor. It causes loss of time in arriving at real differences, because the authority of such distinguished names cannot be ignored: it must be disproved, and even then it is likely to remain for half a century.

16. In "Barclay's Medical Diagnosis," a recent work, (October, 1857,) occurs this paragraph, the only one relating to the subject in the work:

"True aphthæ are less common on the fauces than on the tongue and lips; but a somewhat analogous formation is frequently observed there, which may be either a true exudative process, or merely the inspissated secretion of some of the follicles. These spots may be mistaken for ulceration, and it is only necessary to warn the student of this possibility; though, probably, the mistake is not a very important one. When there is distinctly a deposit upon the surface, its significance is somewhat different from that of aphthæ on the tongue; it is only in childhood that its presence is of importance, because in them it sometimes exists to a great extent: the disease is known as diphtheritis, and indicates a constitutional tendency to that form of plastic exudation which is of so much moment when it invades the trachea in croup."

It will at once be recognized that the diphtheritis I am speaking of had not entered his mind.

17. In a discussion that occured at the Harveian Society,* less than a year ago,

Dr. B. Sanderson said: that the disease recently prevalent in England, was identical with the malignant sore throat described by many authors, and that in a great number of instances scarlatina preceeds it. It was attended with much fever and fetid breath, the fever *sometimes* of a typhoid character. The thickness and adhesiveness of the exudation was *less* marked

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* Lancet, Oct. 1858.

than that occurring at Tours. In England exhaustion and fever destroyed the patient, rather than asphyxia, which suddenly put an end to Bretonneau's patients. In true diphtheria there was no fever, and no fetid breath: both these were remarked in this country. Finally he believed croup and diphtheria (of Bretonneau,) identical, and that the disease in England was not diphtherite, but the pultaceous pharyngitis of the French.

Dr. Sanderson neglects to tell us when the fetid breath occurs in his patients, whether early in the disease, or after the applica ion of caustics, the exhibition of medicine, e'c., which may have caused the decay of the exudation, or disturbed the digestive functions, or vitiated the saliva, so as to cause fetid breath. He does not tell us anything of the pathological appearance, as to whether there was gangrene.

I have observed the fetid breath also, but have found ample reason for it in the causes specified, without looking for it in the peculiarity of the disease. I never saw a patient who had been sick any time, *without* a bad breath, and it is often fetid from the putrescent remains of ingesta between the teeth. May not this tendency to putrefaction spoken of by many, be somewhat exaggerated?

18. Mr. Cleaveland considered diphtheria a very rare disease in England. He had seen sore throat, but no false membrane.

19. Dr. Hutchinson Powell agreed with Dr. S., that the disease lately prevailing, was distinct from that of Bretonneau.

20. Dr. Webber had seen three cases in London, and had *not* remarked the fetid breath or swelling of the throat. A country gentleman had his throat covered with greyish patches, there was no swelling; he died from exhaustion. A child under Dr. Barlow's care, Guy's Hospital, had swelling of the throat for three weeks, with symptoms of croup. He died, the false membrane extended from the larynx into the pharynx.

This is so concise that we are tempted to ask Dr. Webber if he is sure the psuedo-membrane did not extend from the pharynx into the larynx, like diphtherite, instead of from the latter into the former? That is, is he certain the exuda ion *began* in the larynx? The croup *symptoms*, if by these he means only difficulty of respiration, and impaired æration of the blood, this is also found in diphtheritis as it occurs in California, when the larynx remains intact, the impeded respiration depending on the enlarged and invested tonsils and uvula, and the partial occlusion of the nares by false membrane, tenacious fluid, mucous, and thickened membrane.

21. Dr. Campe believed there was genuine epidemic diphtherite in England, but that it was some times complicated with croup, hence the confusion of diagnosis.

Now this is a hint at the true cause of all our difficulty in this matter. But here is undoubtedly a broad characteristic difference. Croup is seldom or never epidemic, nor contagious. Diphtheria is eminently epidemic, and always contagious; but more of this in the proper place.

22. Dr. Semple, at a meeting of the Medical Society of London, (Lancet, Dec. '58), had seen several cases, and made a partial post mortem on *one*,[a] a girl of fifteen years, he found false membrane in the air passages, from which case he infers that true diphtheria extends in the fatal cases, to the air passages. If Dr. Semple had said the true diphtheria of Bretonneau, in the fatal cases extended to the air passages he would have been classically correct; but it is already well known that death has frequently occurred without the disease having reached the larynx.

Trousseau says, (ss 14.) "and frequently 48 hours after the attack the patient dies without the larynx having been sufficiently affected to suggest

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[a] I have seen several fatal cases, and made a post mortem in *one*, and did not find any false membrane in the air passages, from which cause I infer that *true* diphtheria in the fatal cases, does not always affect the air passages.

the idea of croup." Dr. Webber just quoted, (ss 20) says the gentleman "died of exhaustion," "greyish patches in the pharynx."

23. Dr. Kingsford in a letter to the Lancet, graphically, in my opinion most accurately, describes the *genuine* disease, *the* genuine very latest *diphtheria*, not the variety described by Bretonneau, but the last born, and most uncontrolable child of that family, as all last children usually are. If we call Bretonneau's sub-diphtherite, and ours per-diphtherite, (if the reader will allow a chemical prefix for an instant for the sake of illustration,) we obtain a comparative idea of the two affections.

But this letter of Dr. Kingsford should be read by every one who has not, and yet ever expects to see a case of diphtheria. If he should take notes by the bed-side of one of our genuine cases, of each form, the "*mild*" and the "*severe*," he would find nothing to alter except the "*obstinate vomiting*," which is not always observed, and yet M. Duche, (ss 9.) verifies the occurrence of the vomiting; but in those cases in which the air passages are not involved.

Dr. K. says:

"Diphtheria may be divided into the *mild* and the *severe* forms.

"The mild form, which, for the sake of distinction, may be designated the *diphtheritic sore-throat*, is ushered in by a variable amount of feverishness, loss of appetite, and at first only slight pain in swallowing; the tongue presents a thick, white, creamy coat, through which some of the papillæ are visible: the velum palati, uvula, and pharynx are of a bright red color; the tonsil glands are much swollen and of the same livid hue, and upon the inner side of one or both of them distinct white patches are seen, which in some instances resemble an exudation from the sulci of the tumid gland, but more frequently are flat and filmy in appearance, not confined to the tonsils alone, but spread over the uvula and posterior wall of the pharynx: both the exudation and the filmy deposit adhere tenaciously to the sub-mucous surface, and cannot easily be scraped off. Ulcerative stomatitis not rarely precedes and accompanies this mild form of diphtheria—indeed, by some, they are considered to be identical; the paroid and sub-maxillary glands are not much swollen, although one or two enlarged glandulæ concatenatæ may often be detected.

"The severe form, or *genuine diphtheria*, is always characterized by a high state of fever, hot pungent skin, flushed countenance, congested lips, a rapid feeble pulse, great difficulty in swallowing, and hurried respiration; the tongue is covered by a thick, dirty, yellowish-brown, or sometimes slaty-colored coat; the velum palati, uvula, and pharynx are of a deep, dusk, *erysipelatous* redness; the tonsils usually enormously swollen, and of the same dark-red color, but instead of the white patches observed in the mild form, a large ash-colored membrane is spread over the inner side of one or both tonsils, and also upon the uvula and posterior wall of the pharynx. As the disease advances, the above symptoms increase in severity; the breathing becomes stertorous from *mechanical* obstruction; deglutition so painful that young children will refuse to swallow even liquids; the saliva dribbles from the mouth, and a foul, acrid discharge often flows from the nares; the pulse becomes more rapid and feeble; the glands of the neck are now swollen and tender, and the voice is hoarse and indistinct; the patient, restless, tosses about on the bed, or else lies on his back in a semi-comatose state. These cases, when fatal, terminate either by rapid prostration of the vital powers, or by an affection simulating croup, from extension of the diphtheritic membrane into the air passages; in both instances, death is usually preceded by obstinate vomiting, probably the result of inflammation or irritation of the par vagum.

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"In fatal cases the post-mortem examination reveals the ash-colored membrane spread over the pharynx, extending to the posterior nares and

down the œsophagus; but when death is preceded by symptoms of croup, it is found also in the larynx and trachea. Upon detatching this membranous exudation, the sub-mucous surface presents an ecchymosed appearance, but no distinct signs of ulceration."

One thing should specially be borne in mind: there is no ulceration in this disease, except caused by application of caustics, or efforts to remove the exudation, by scraping or tearing. It is too adherent to admit of being removed except in small fragments.

There are no doubt complications, such as measles, scarlatina, etc., in which ulcerated, and even gangrenous sore throat may supervene, and as it were supplant the original disease. But in idiopathic uncomplicated diphtheritis, there is no ulceration marked or manifest.

24. Diphtheria is confounded in the minds of many with putrid sore throat—angina gangrenosa. This is a mistake, as will readily be perceived by examination of the diagnosis of angina gangrenosa.

M. Bouchut says it was a great mistake to unite under the denomination of membranous angina, Syrac ulcer, angina gangrenosa, throat disease of Hennham, angina couenneuse and croup, diseases essentially different, and very common in infancy. Samuel Bard, of New York, who opened the way in 1771, could not succeed in this impossible labor which M. Bretonneau attempted a century later, and which led astray Guersant, one of the most distinguished contributors to the *Dictionaire de Medecine*, in 3 volumes. Far from simplifying the study of throat diseases, (*anginae*) this manner of proceeding is the origin of a deplorable confusion, which has reigned almost generally among physicians, for the last thirty years. This explains the success of a multitude of pretended specifics, utterly useless, which have been prescribed for various diseases of different nature, at the same time.

If for example, we call apthæ and diphtheria both stomatitis, and then find that borax and honey will cure stomatitis when it is apthæ, it is at once called a specific for stomatitis, though it may be utterly worthless in the stomatitis represented by diphtheria. This is precisely the way in which alum, tannic acid, &c. became specifics for the present malignant angina. These errors should be abandoned, and the old notions should be revived which were generally admitted up to the time of Bretonneau, who assumed the right to modify this part of the science.

"It consists of a broad, excavated, sordid ulcer, forming a concretion, white, livid, or black, called an eschar, says Aretœus of Cappadocia." This is true, and it is surprising that this definition has been for an instant ignored, and that such cases as all have been corresponding to it, could ever have been metamorphosed into membranous sore throat, or that the latter could ever have been called angina gangrenosa or Syriac ulcer.

Further, Guersant cast a doubt upon the existence of angina gangrenosa, and was followed by a great number of physicians, but every body has not yielded to this opinion, and there may now be found in the *Compendium de Medicine*, an article upon angina gangrenosa, in which the author protests as I do now, (says Bouchut), against the erroneous union of ulcerous and gangrenous sore-throat, and croup.

I have now under treatment, says M. Bouchut, four children, that have angina gangrenosa. Two of these have also scarlatina, and the other two are idiopathic or primitive putrid sore-throat, independent of any exanthema. Yet unless we admit that these two children are affected with *scarlatina without eruption*, and consequently angina scarlatinosa, *without* scarla ina, which certain systematic physicians would certainly do, we must recognize the existence of an ulcerative or gangrenous sore-throat, independent of all eruption.

One of the four, a little girl, came under the care of M. Bouchut with a *pointille*, red, confluent eruption, causing a uniform rosy tint, upon which if the finger were drawn along, there remained for a moment a white mark, an

important *diagnostic sign of scarlatina.* She has at the same time difficult deglutition; one very large tonsil, which may be felt under the left inferior angle of the jaw; the pharynx is red and denuded of epithelium. Both tonsils are considerably enlarged, especially the left, which has suffered considerable loss of substance. At first this tonsil had on its internal aspect a deep irregular excavation, the edges of which were ragged, and the walls unequal, and covered with a thick, odorless, purulent exudation.

The swollen uvula, at the point corresponding to the ulcer in the tonsil, was covered with a pultaceous greyish exudation. There was no swelling of the glands of the neck.

The other child had a different form of scarlatina. She had the milliary form, a troublesome thing, which is followed during convalescence, with a very general and complete desquamation, and sometimes with other very severe sequelæ. The exanthema in this case, consisted of minute, red, confluent points, surrounded with an inflammatory areola; it gave place to a general rosy tint of the skin upon which one could write the word "scarlatina," rapidly with a pencil, and the white letters, though fugitive, were sufficiently persistent to allow the word to be read before they vanished.

This little patient had difficult deglutition, red pharynx, very large tonsils, the internal aspects of the latter covered the first day with a greyish odorless eschar, which fell off at the expiration of twenty-four hours, leaving behind a loss of substance, four or five lines deep, with red, ragged edges, and the unequal, and anfractuous base of which, was covered with a compact puriform exudation.

This was an accurate imitation of the gangrenous ulcer, described by Aretæus of Cappadocia, and known for centuries anterior, under the name of *Syriac Ulcer.*

The third child was taken sick with pains, lassitude, fever, the throat painful and swallowing difficult. Upon the left tonsil there appeared a large, deep, irregular ulcer, excavated, with deep, tortuous sulci, (*anfractuosities*). The tonsil was very much swollen, appreciable under the angle of the jaw, but without ganglionic enlargement of the neck: the surface of the body never presented any trace of eruption.

The other child was the exact copy of this, with the exception of some slight shades of degree.

25. It would be impossible to describe these two forms of disease, scarlatina with its characteristic sore throat, and putrid sore throat without scarlatina, in a clearer or more appreciable manner, and evidently neither of these are what we understand by the diphtheria of 1857, 8, and 9. Yet many physicians and authors still persist in considering it identical with these two diseases. The error has become popular in California and the first question asked when a child has any affection of the throat is, Doctor, do you think the child has putrid sore-throat, by which the people generally mean the late diphtheria, and yet there is never any gangrene, of even the mucous membrane, much less the subjacent cellular tissue, as in angina gangrenosa. The mortification, when there is any, is that of the *false* membrane, the vitality of which has been destroyed by caustics; the surface still in contact with the true membrane is never gangrenous, and the latter is seldom even ulcerated, except as a consequence of burning.

The disease is frequently miscalled, through a base vanity of getting the reputation of curing putrid sore throat. An unscrupulous physician will tell the friends the child has *the* putrid sore-throat, when it has nothing but a muguet or sprew; but these gentlemen, though ready on occasion to assert their triumph over any number cases of diphtheria, could not be hired to let one of their professional brethren see one of their cases.

These are the men who bring such discredit on the profession. These are they who vitiate medical nomenclature, and whose practice is a chaos of ab-

surdities, whose patients, by the favor of God, survive sometimes, "despite the disease and the doctor." But this is digression.

26. Dr. James Blake, M.D., F. R. C. S., of Sacramento, in a memoir published in the *Pacific Medical and Surgical Journal*, for August, '58, says:

"The first effect produced by the poison is evidently on the nervous system. Drowsiness, prostration or oppression are manifested by infants or complained of by adults, and when the disease is prevailing this desire of children to sleep at other than their usual hours should awaken our suspicions. The pulse is accelerated from the first, but generally soft and typhoid, although, in some cases it is, for a few hours, rather hard. The temperature of the skin is raised, although it is seldom harsh or dry, but frequently moist, or even covered with profuse perspiration. There is seldom any pain, rarely head-ache or back-ache. The tongue is usually coated, edges red and papillæ prominent. The appetite may remain good, and the digestion unimpaired. If we examine the throat, we may, even within twelve hours after the occurrence of the first slight symptoms, find the tonsil covered with a greyish, pultaceous exudation, which rapidly extends upwards into the nostrils, and downwards towards the larynx; and again, we might only detect a redness of the tonsil, and a small point of exudation two or three days after the commencement of the disease, and at a time when the symptoms of general prostration had become alarming. Again, cases present themselves in which the general symptoms and the anatomical lesions proceed *pari passu*; but in almost every case that I have seen, I have considered that death was the result rather of the action of the poison on the system than from obstruction of the larynx. In from twelve to twenty-four hours after the formation of exudation on the tonsil we shall generally find the cervical glands enlarged, and in protracted cases this enlargement may become so great as to afford a serious obstacle to deglutition and respiration; I have seen cases in which I think death was thus produced, when the patient might otherwise have rallied from the effect of the poison.

"The duration of the disease is very uncertain. I have seen it terminate fatally in four days from the first ascertainable departure from perfect health, and this in a strong, healthy child; and I have witnessed it run along for two or three weeks, and then terminate fatally. The cases that arise from contagion, and remain exposed to the original source of contagion, I believe as a general rule, run a more rapid course than the sporadic cases: thus we frequently find two or three children in the same family dying within a day or two of each other, although the sporadic case might have had the disease some days before the others took it. This is probably owing to the continued absorption of the poison in a state of concentration."

27. R. J. Fourgeaud, M. D., also of Sacramento, says

"The disease begins in a very insidious manner by a little engorgement or inflammation of the soft palate, pharynx, and one of the tonsils. (The attack seldom commences on both at the same time, but soon extends to both if not arrested.) At this period of the malady the patient complains but little; there is often no fever, or it is very moderate. The pain in the throat is much slighter than in the usual forms of common sore throat, so slight, indeed, that the little patients go about playing, as if nothing was the matter. In some exceptional cases, however, the fever and inflammation about the pharynx are considerable from the beginning. The characteristic signs of the affection soon follow this period of invasion. They consist in small portions (placques) of white or yellowish lymph deposited on the soft palate, the tonsils, and the posterior part of the pharynx. The cervical and sub-maxillary glands become inflamed and swollen, and the pain in swallowing and opening the mouth is occasioned more by the engorged state of the glands than by the internal secretion of lymph. These deposits go on in-

creasing in size more or less rapidly, and, in violent cases, in a few hours the whole cavity of the throat is covered by them. Generally, one side is more affected than the other, and, upon examination, the glands corresponding with the parts affected will be found more swollen than those of the opposite side."

Again, Dr. Fourgeaud says of this same disease, "membranous sore throat seldom terminates fatally without the previous attendance of all the symptoms of croup." But this is contradicted by Dr. Kingsford, (§ 23.) Trousseau, (§ 14.), my own case of autopsy. (.)

Dr. Blake says the most common anatomical cause of death, is in his opinion, the enlargement of the cervical glands.

Now without a post mortem examination Dr. B. has, as if by accident, hit upon a large element in, at least the proximate, cause of death.

28. Dr. Fourgeaud is evidently very much restrained in his diagnosis, because he has made up his mind in the beginning, that Bretonneau's diphtheria and ours are identical. The former always terminated in croup, therefore this must. Dr. F. had probably not seen the post mortem appearances, for he attributes the hoarse voice, and gasping respiration, to affection of the larynx, when an autopsy, doubtless would have in most cases, shown him this organ intact, as already proved by numerous authorities. The impeded respiration results from the enlarged cervical glands, enlarged tonsils and uvula, enlarged and coated epiglotis cartilage, nose plugged up with membrane and mucous, certainly abundant reasons for gasping respiration or aphonia, without any aid from exudation in the larynx.

29. The cause of the disease is unknown. Bretonneau, (for we cannot deny that these two diseases are near of kin; they are as near as parent and child,) thought his diphtheria needed a damp atmosphere for its development; but I will explain how far that is from applicable to our diptheria.

In our climate the air in summer becomes so dry, that if an ordinary soft wooden pail or bucket be half filled with water and set in the sun, in the open air, for six hours, and then two quarts of water be added, it will leak through the joints of the shrunken staves above the surface of the first portion of water. A miner uses a bucket to bail water from a hole all the forenoon, and although it is perfectly saturated with water; yet if he leaves it in the sun for three hours, while he goes to his dinner, when he returns it will often fall to pieces as he attempts to take it up.

This is the kind of air in which the disease has occurred with unequalled fatality in this State. In this city I cannot ascertain that a case has occurred in that part of the town, (not a small part,) built over, or near the waters of the bay, or on the salt marshes near it. But I have heard and seen cases in the high part of the city, and on bluff headlands extending into the bay, points that from their elevation and constant exposure to a strong breeze, would be thought unassailable by any morbid effluvia.

30. It is idle to speculate upon the *nature* of the element of the contagion. It belongs to the category of inscrutables, which nature has excluded, by their very subtlety, from the recognition of our gross organs and clumsy tests.

Would science ever be able to detect the musk in air in which it could be merely smelt? So these inappreciable elements of disease are almost beyond the domain of rational enquiry. We see their effects, and recognize the existence of a power to destroy of which we were before ignorant. This is all. The rest is speculation, for the indulgence of which human life is bounded by too narrow limits. I believe pseudo-membrane is conceded to be an exudation, and hence it will be pertinent, that we understand as clearly as the present state of science admits, what is understood by exudation, and what is at least the proximate cause.

31. Dr. Bennet is perhaps better authority on this subject than any other author, and here is his description of the "production of exudation."

"Exudation in every case results from a previous series of changes which has taken place in the capillary vessels, and blood contained in them. These changes, as we are enabled to follow them in the transparent parts of animals under the microscope, are seen to occur in the following order:—1st, The capillary vessels are narrowed, and the blood flows through them with greater rapidity, 2d, The same vessels become enlarged, and the current of blood is slower, although even. 3d, The flow of blood becomes irregular. 4th, All motion of the blood ceases, and the vessel appears fully distended. 5th and lastly, The liquor sanguinis is exuded through the walls of the vessel, sometimes accompanied by extravasation of blood corpuscles, owing to rupture of the capillaries.

"The first step in the process, viz., narrowing of the capillaries, is readily demonstrated on the application of acetic acid to the web of the frog's foot. If the acid be weak, the capillary contraction occurs more slowly and gradually. If it be very concencentrated, the phenomenon is not observed, or it passes so quickly into complete stoppage of blood, as to be imperceptible. Although we cannot see these changes in man under the microscope, certain appearances indicate that the same phenomena occur. The operations of the mind, for instance, as fear and fright, and the application of cold, produce paleness of the skin; an effect which can only arise from contraction of the capillaries, and a diminution of the quantity of blood they contain. In the majority of instances, also, this paleness is succeeded by increased redness, the same result as follows from direct experiment on the web of the frog's foot, constituting the second step of the process. In other cases, the redness may arise primarily from certain mental emotions, or from the application of heat. In either case it depends on the enlargement of the capillaries, and the greater quantity of blood they contain.

"The variation in the size of, and amount of blood in, the capillaries, is conjoined with changes in the movement of that fluid. Whilst the vessels are contracted, the blood may be seen to be flowing with increased velocity. After a time the blood flows more and more slowly, without, however, the vessel being obstructed; it then oscillates, that is moves forwards and backwards, or makes a pause, evidently synchronous with the ventricular diastole of the heart. At length the vessel appears quite distended with yellow corpuscles, and all movement ceases.

"Again, these changes in the movement of the blood induce variations in the relation which the blood corpuscles bear to each other, and to the wall of the vessel. In the natural circulation of the frog's foot, the yellow corpuscles may be seen rolling forward in the centre of the tube, while on each side a clear space is left, only filled with liquor sanguinis and a few lymph corpuscles. There are evidently two currents, the centre one very rapid, that at the sides (in the lymph spaces, as they are called,) much slower. The colored corpuscles are hurried forward in the first, occasionally mixed with some lymph corpuscles. These latter, however, may frequently be seen clinging to the sides of the vessel, or slowly proceeding a short distance down the tube in the lymph space, and then again stopping. Occasionally they get into the central torrent, when they start off with great velocity, and accompany the yellow corpuscles. It has been said that these corpuscles augment in number, accumulate in the lymph spaces, and obstruct the flow of blood. In young frogs their number is often very great; but then they constitute a normal part of the blood, and in no way impede the circulation. In old frogs, on the other hand, all these, and subsequent changes, may be observed, without the presence of colorless corpuscules. When the capillaries enlarge, however, the central colored column in the smaller vessels may be seen to enlarge also, and gradually approach the sides of the tube, thus encroaching on the lymph spaces. The slower the motion of the blood, the closer it comes, until at length the colored corpuscles come in contact with the sides of the vessel, and are more or less compressed and changed in form. At length the vessel is completely distended with colored corpuscles, the ori-

ginal form of which can no longer be discovered, and the tube appears to be filled with a homogeneous deep crimson fluid. This is congestion. If the morbid process continue, the vessel may burst, causing haemorrhage, or the liquor sanguinis may transude through its walls, without rupture, into the surrounding texture. This last is exudation."

31. In this article Dr. Bennet has shown us two facts (the existence of which we have all witnessed, but which few could explain.)—congestion and exudation, and they are two facts of the utmost significance in this disease. The exudation is plainly a sequence of the congestion, and if we would arrest the exudation, we must direct our remedies to the removal of the congestion. This is so plain that it needs no illustration.

32. Dr. Bennet says "exudation poured out on a mucous membrane, sometimes presents a fibrous mass, as in cases of croup and diphtheritis."

[Again he says, the mucous membrane is liable to "exudation into the areolar tissue, between the basement membrane and epithelium, or upon the external surface." Upon this excellent authority, diphtheria is an exudation, and not a secretion merely, as some attempt to maintain.]

33. I will here remark, that in the first stage of diphtheria, we need have no fears that the larynx is yet affected, for the affection of the mucous membrane of the nutro-respiratory apparatus does not take place in this manner; and although it is a fact well known to all observing practitioners of some experience, that the false membrane in croup, never proceeds up into the mouth, but goes down the trachea and into the bronchi, yet the authority of professor Bennet upon this point, will be more satisfactory than an unsustained assertion: "It may be accepted as a general law, which admits of but few exceptions, that morbid changes in the mucous membrane of the pharynx and larynx, proceed from above downwards, as is well observed in scarlatina. Lesions often attack the fauces or tonsils and spare the larynx; but if *long continued*, the latter is affected consecutively."

34. It appears from previous citations that great confusion has reigned in the profession in the diagnosis of diphtheria. Diseases with few points of resemblance have been considered identical with it, and hence the treatment has often been vicious. A careful examination of the previous paragraphs will show:

I. That diphtheria in its broadest sense, is any disease attended with exudation of false membrane: hence croup, sprew, diphtheritic of the mucous membrane of Bretonneau, the sore throat attending scarlatina, are all examples of diphtheritic exudation, or of diphtheritic sore throat or mouth.

II. That besides this generic diphtheria, which exists in all cases where there is membranous exudation, there is a peculiar diphtheria, recognized by peculiar characteristics; an idiopathic, very dangerous and contagious malady. (Croup is not contagious; thrush is not contagious; the diptheria of scarlatina is not contagious as diphtheria, but only as an attendant of its principal, scarlatina; angina gangrenosa, or Syriac ulcer, is not contagious any more than hospital gangrene).

35. This disease is recognized by the following salient characteristics:

High fever, rapid pulse, congested and watery eyes, coryza, diminution of urine, difficulty of deglutition even of fluids, generally by enlarged parotid and submaxillary glands, invariably by enlarged tonsils, one or both, invariably by the characters of pseudo-membranous exudation on the tonsil, uvula, pharynx, or nasal lining.

36. Unless nearly all these symptoms concur, it cannot be considered a case of severe diphtheria.

37. I consider it of the utmost importance that this well marked definition of severe diphtheria, so well laid down by Trousseau and Dr. Kingsford, before quoted, be insisted on, as it will save a vast amount of random practice. Any affection of the fauces that falls below this standard to any con-

siderable degree, may safely be considered spurious, imitative, or mild diphtheria; of course to be regarded as a dangerous foe when it occurrs during the prevalence of the severe form, but not to be treated with the same merciless rigor as the violent malady.

37. There is another form of this malady which has occurred in this city and of which I have seen one case fatal in seven days. It is a sort of masked diphtheria. There is the high fever, rapid small pulse, tenacious discharge from the nares, woolly respiration, but no visible false membrane. The tonsils and uvula neither enlarged nor stained with exudation, and there is little difficulty in deglutition; but the breath is of horribly gangrenous odor from very early in the disease—the first or second day. May it not be gangrene of the lung, the poison assuming that localization instead of the fauces? Or possibly it is an exudation in the trachea or bronchi, which has rapidly undergone decomposition. The patient, a lad eight years old, died of exhaustion, and in a semi-comatose condition, though his consciousness was perfect when roused from his stupor. There was no autopsy. Such cases may be considered as exceptions to a general rule. They occur occasionally, and perplex our diagnosis. I should have mentioned that in this case there was vomiting frequently the last day of life. (¶ 23.)

38. The details of treatment of diphtheria depend upon many contingencies. The general indication is not denied by any. All medical men are in harmony upon this point, namely: the false membrane should be destroyed and its reformation prevented. But in the multitude of agents that may be employed with a view to this result, it is not so easy to make the very best selection.

39. It is without doubt true, that any means that will effect this purpose in croup, or in the mild diphtheria of Bretonneau, will have a vast influence upon this also when employed sufficiently early, and with a proper regard to the vast difference in degree in this affection, compared with its two congeners, croup and *mild* diphtheria:

40. The treatment recommended by the distinguished Edinburgh professor, is crystals of Nitrate of Silver, two scruples or one drachm to the ounce of distilled water, in laryngitis, and pharyngitis, with exudation and ulceration, in the latter he also employs the steam of water by inhalation; the object of which is readily appreciated. His internal treatment would consist of diuretics, diaphoretics, expectorants, and perhaps emetics; but he would not use calomel for its peculiar effect, nor resort to bleeding either local or general. He also suggests sulphate of copper and astringents.

41. Dr. Horace Green of New York, would beyond doubt, depend principally upon Nitrate of Silver as a local application.

42. Bouchut insists upon the ablation of the tonsils early in the disease, not only to remove the false membrane which appears on them, and which he considers the localization of the disease, but also to facilitate respiration, and thereby retard that rapid deterioration to which the blood is so liable in this affection. Grant that the false membrane will reform on the cut surface, still it is no objection to the operation as a means of facilitating respiration, and if the exudation does not reappear all is gained; the disease is vanquished. No one can oppose it through fear of hemorrhage, especially in a child above three years: for the cut surface may easily be seared with the actual cautery, or the bleeding may be instantly arrested by the application of a little Monsel's Salt in powder, and both the cautery and styptic are valuable adjuncts in the modification of the disease. It cannot be maintained that the mere ablation of the tonsils *per se*, will eradicate the disease, but by facilitating the aeration of the blood, it must oppose a powerful obstacle to the march of decomposition, so much dreaded in this malady. Every one is aware how difficult it is to respire with the mouth closed when the nose is in any wise obstructed. How much more difficult for the victim of diphtheria with the entrance to the throat clogged by two enormous tonsils, an enlarged uvula, and the nares often completely obliterated by tenacious mucous!

In such a case the ablation of the tonsils, and even of the uvula, would be an immense relief to the sufferer, and should in mercy be practiced, though scarce any hope were entertained of ultimate benefit. If one were dying of a typhoid fever, and suffering with the agonies of a tooth-ache, we would not hesitate to remove the tooth because its extraction would not add a moment to the life of the patient; we do it on the general principle that suffering should be mitigated where it can be done without risk. A host of physicians in France make faces at Bouchut because he presumed to treat a systemic disease by a local remedy. They all burn the tonsils with acids to remove the false membrane, and even with a hot iron, and are not very particular how much adjacent tissue is included in the operation, and then most irrationally laugh at M. Bouchut for making a clean cut with a knife, carrying away false membrane and swollen tonsil together in one rapid and almost painless stroke. I would certainly remove the tonsils as soon as the *diphtheria* appeared on them, provided there were the other symptoms of the severe form of diphtheria. It appears to me a means of the greatest utility. Of course constitutional treatment, and local applications need not be neglected.

43. The following four cases I find in the *Lancet*. It will be seen that the first three—children—were fatal, the fourth—adult—survived. This one success was doubtless due in part, to the greater facility of treating adults energetically. I cannot well give the treatment alone, in these cases, so I give the author's (Mr. Benjamin Godfrey, M.D., M.R.C.S.L.) own report.

"Case 1.—J. B——, a little boy, aged two years. He has been healthy and strong through life, with the exception of the trivial ailments incident to childhood. Five months ago he suffered from discharge of pus from the ear, with occasional epistaxis. These ailments soon passed away, and he continued pretty well until the present attack.

Oct. 17th.—The child complained of cold in the head: discharge of yellow mucoid matter from the nose, with occasional hemorrhage, dyspnœa, and dysphagia; great drowsiness and extreme languor. The tongue was slightly coated, but not injected: the skin was moist and comfortable; the pulse quick and feeble, 120: pupils dilated. On examination of the throat, a small, whitish spot was observed on the mucous membrane of the right tonsil, about the size of a pea; bowels constipated. Ordered the sixteenth of a grain of extract of belladonna, with one grain of carbonate of ammonia, every three hours; a rhubarb and jalap powder at bed time.

18th.—The patient is much weaker; dyspnœa greater, but dysphagia less. The spot has become of an ash hue, extending over the right tonsil, and slowly creeping over the uvula. Pulse 130. Repeat the mixture.

19th and 20th.—The discharge from the nose and mouth has increased—very acrid, and of a highly offensive odour; the throat externally is much swollen; the parotid and sub-maxillary glands are much enlarged; both tonsils are coated with the ulcerative process (?); pulse 130; tongue coated, white; bowels nicely relieved, but great exhaustion and prostration is apparent. Ordered carbonate of ammonia and tartrate of iron every three hours; port-wine and beef-tea in abundance.

21st.—Still getting weaker: almost pulseless; extremeties cold; face pallid and anæmic; throat very much swollen externally. Ordered warm fomentations; milk, wine, and beef-tea, and ten minims of the tincture of sesquichloride of iron every three hours.

22d.—Less swelling of the throat externally. The black gangrenous mass is sloughing away, and a line of demarcation is visible, of healthy granulations springing up to throw off the dead fœtid mass, and restore health to the diseased part. Dyspnœa less; dysphagia now but slight. Repeat the medicine and nourishment.

23 and 24th.—Very much better. Several pieces of highly offensive dead material have passed away. Pulse stronger; tongue nearly clean: bowels relieved; pupils less dilated, but still drowsy and very weak.

Day by day the little sufferer improved, and gathered strength each day. The only drawback to his recovery was an occasional attack of epistaxis, which blanched the restored color of the cheeks and enfeebled the returning powers. Iron and quinine, with strong beef-tea and wine, were freely given, but exhaustion soon set in, and he died on the 3d of November, a fortnight after the attack, anæmiated and exhausted.

Case 2.—B. B——, residing in the same house. He was a strong, well-built boy, of excitable temperament, and affectionate disposition. He was taken ill on the 22d of October. He complained of great langour, chilliness, stiffness of the neck, dysphagia, and headache. The tongue was white, but the papillæ were not more prominent than they are in irritation of the stomach. The throat was much swollen externally, and on the tonsil a small ashy spot was seen. No heat of skin; no dryness, but the palms of the hands were moist and comfortably warm; pulse quick and weak, 130. Ordered the belladonna and ammonia mixture every three hours.

Oct. 23d.—Bowels freely moved; throat much worse; spot very much extended, and the breath extremely fœtid; discharge from the nose great; pupils much dilated; urine free and normal. Ordered to gargle well with warm water, alternating with the chloride-of-zinc gargle. Wine and beef-tea to be freely taken, and ten drops of the tincture of muriate of iron every three hours.

24th.—Throat more swollen: dysphagia greater, and dyspnœa also increased. Applied nitrate silver solution, ten grains to the ounce, to the throat with a sponge probang. Small pieces of black disintegrated mucous membrane came away. Complains of the wine and beef-tea burning his throat, and causing his ears to tingle.

25th.—The throat is one black gangrenous mass, the odour of which is very disagreeable. His powers are fast failing. Takes half a pint of port wine a day, with beef tea, &c. Milk also in abundance.

26th.—Fast sinking. Throat exceedingly swollen; dyspnœa greater than dysphagia; pupils much dilated; extreme drowsiness, yet perfectly sensible when aroused. He continued failing till the 28th, when he expired.

Case 3.—J. B——, aged seven years, brother of the patient before mentioned. He was attacked with the same disease, with precisely the same order of symptoms. He was treated with chlorate of potash and cascarilla, the former part of the illness, and nitro-muriatic acid and gentian the latter part; but in seven days from the time he was attacked he also died.

Case 4.—In the same house was a young lady who had watched over the before-mentioned children, and on the 28th she also was taken ill. The first symptoms were,—shivering, and intense prostration, so powerless that she could not stand; tingling of the throat, back of the nares, and in the ears; the throat became dry, and deglutition became difficult. On examining the throat, there was the plague-stricken spot on the left tonsil. Ordered four ounces of port wine and strong beef-tea, with the nitro-muriatic acid and cascarilla mixture.

Oct. 29th.—The spot is much increased, extending over the uvula. Powers enfeebled; pulse 120, very feeble; tongue white and furred; skin cool and moist; bowels regular; urine scanty, but natural. She can scarcely breathe through her nose. The discharge is increased from the mouth and nose, and the breath is become fœtid. Ordered the chloride-of-zinc gargle, and thirty drops of the tincture of the sesquichloride of iron in infusion of columba root. Strong hydrochloric acid was applied with a glass rod to the ulcerated surface. Several large pieces sloughed away.

30th.—Pulse very feeble, and bodily power failing. The whole of the soft palate and back of the throat is covered with the sloughing mass. The ears and Eustachian tubes are very tender and painful. Deglutition is performed with great effort and pain. The nares are extremely painful, and the discharge acrid and disagreeable. Applied again the muriatic acid. Ordered

half a pint of port wine a day, with eggs and beef-tea, and to continue the medicine.

31st. Still getting weaker. Pulse 130, irritable: skin cold and clammy; the wine passes down her throat like liquid fire, giving great pain. Ordered wine and beef-tea *ad libitum*; the iron to be increased in quantity, three drachms of the tincture to be taken every day.

Nov. 1st.—Better; throat less swollen, and dysphagia less; bowels well moved; dyspnœa less. At every gargle pieces of dead material came away. Steaming her nose and throat over hot water has relieved her much. Skin beautifully warm and moist.

2d and 3d.—The throat is granulating quickly; several large pieces have been thrown off; fœtor less, and appetite improving; pulse 120, fuller and more regular.

From this time she began gradually to improve; each day pieces of morbid material were brought away. The throat healed up in the course of a week or two perfectly, and day by day her powers improved, and she left my care on November 15th, quite recovered.

Remarks.—The disease appears to me to be confined to the mucous membrane, neither touching the muscular nor glandular structure. The glandular enlargement is due to sympathetic irritation, the same as we see often in other parts of the body; thus a wound in a leg producing an enlarged gland in the groin. The question has been asked—"Is it scarlet fever *without* the rash?" This, I think, is answered—1st, *by absence of all fever*; 2dly, absence of all rash; 3dly, papillæ of the tongue not enlarged; and 4thly, no desquamation of the cuticle after the disease passes off. Yet, on the other hand, scarlet fever existed in the adjoining house. It differs also materially from cynanche tonsillaris. In that disease the abscess forms within the tonsil, and bursts its way out. But in diphtherite, the morbid change commences on the surface of the mucous membrane, and is confined solely to that covering. The extreme and rapid depression is only equalled by the depression of malignant scarlet fever, or the collapse of asiatic cholera. Each patient that died appeared to sink from exhaustion and partial asphyxia.

Treatment.—The main point to keep in view is to support the patient's powers, and check as far as possible the inroads of the disease. The former by stimulants and tonics; the latter by the application of the strong mineral acids. The question may arise, might not tracheotomy have been successfully employed to relieve the dyspnœa. My reply is that the depression of the patient's powers was far greater than the dyspnœa, so that the operation would have been unsafe. That depression did not result from the blood being imperfectly aerated is shown by the depression appearing before the dyspnœa. The dilatation of the pupil did not depend upon the belladonna given, for it existed as a marked symptom in every case. As regards remedies, I believe the tincture of sesquichloride of iron the best. The essentials of the disease, or the symptoms in the order they occur, are these:—*Shivering; intense depression; dryness and tingling of the throat, nares and ears; external swelling of the glands; a whitish spot on the mucous membrane of the tonsil, gradually deepening in color as the disease progresses; dysphagia and dispnœa; dilated pupil; impending asphyxia, and death.*"

The following cases came under my own observation:

44. Case 1.—G. S. æt. 17 months. I was called to this case March 1st, at 10 A. M. The child was considered in health the previous day.

Appearance at first visit. The child's face looks flushed and congested; there is considerable lachrymation, and profuse coryza. The nasal discharge is transparent and very tenacious. Respiration somewhat rattling, skin hot, pulse considerably accelerated; lies with his head thrown back, and is very drowsy; swallows with difficulty. Sub-maxillary and parotid regions considerably enlarged. Patches of false membrane, two or three lines in diameter on velum palati near uvula. One on left side of tongue near the point,

of dull grayish color. Uvula ulcerated, tonsils enlarged, very red except a few points covered with the diphtheritic exudation.

Cauterize with arg. nit. solid, palate and tonsils. Solu ion perchloride of iron internally and locally to the fauces. A slight emetic of ipecac; bowels cleared with enemas; cold compresses to the head and mustard to the feet.

2d day.—No improvement. New patches of exudation have appeared; parotids more enlarged; a small patch of false membrane the edges of which are insensibly lost in the natural membrane, appears in the right nares. From the first I have given friends no encouragement; now assure them there is scarcely any hope.

To day the child gets grain doses of calomel every two hours, until it has taken six grains. (To be sure the calomel is all taken it is put upon the tongue dry with a little sugar and water swallowed after: this obviates the objection often made by conceited physicians that the patient does not get the remedy from any body's hands but their own.) Cauterization repeated. Perchloride of iron con inued.

3d day.—Ordered carb. potass. drm. j, water oz. jv. teaspoonful every two hours night and day. Cauterization and calomel omitted. Infant evidently worse.

5th day.—All symptoms worse; respiration more impeded; part of fluids come through the nose on a tempting to swallow. Besides the perchloride of iron, borate of soda dissolved in glycerine, has occasionally been used to wash the fauces. Sleeps most of the time. Head constantly stretched back as if to keep the trachea more open. False membranes much increased. Throat sponged freely with dilute muriatic acid, and ordered repeated every two hours.

6th day.—A consulting physician believes death inevitable. Recommends nitric acid in proper quan ity internally. It is given.

Another experienced and learned physician seeing the case with me, recommends grs. xij Hg. Cl. in 24 hours. As there can be no objection to any treatment which offers possible hope, it is ordered.

7th day.—Still worse, The sub-maxillary region is so much engorged, that the chin is nearly obliterated. The last prescription was given strictly as ordered, and produced green stools. Pulse small, but 160 per minute; no "head symptoms," except the disposition to sleep. The eyes do not turn under the orbital arch, the lids do not droop, nor the thumbs contract towards the palm of the hand. The only apparent suffering is that of impeded respiration. Three physicians besides myself verify the false membrane in the nostrils. At 10 A. M. to day, the child holds a cup in both hands without aid, and sits up and drinks, part of the fluid coming back through the nostrils.

The diminution of muscular strength is not as much as we should expect in a week from an asthenic malady. True, the child has been freely nourished from the commencement with beef tea, pure native wine, prepared milk, corn starch, etc.

All treatment suspended except washing the mouth with some domestic gargle.

At 11 P. M. the infant dies without any marked increase of suffocation above what appeared this morning.

Autopsy 12 hours after death. Present, Dr. McCormick, U. S. A., and Dr. Trask. The diphtheritic exudation did not extend a line below the root of the epiglotis. The epiglotis cartilage is covered on both sides with a thick dip heritic exudation. The uvula is perfectly incrusted with the diphtheria. The posterior nares were lined with a diphthera more than a line in thickness; soft palate covered on both sides; patches of mole like excrescence, on the sides of the tongue, which might be peeled off leaving bloody points beneath.

No false membrane or inflammation in the trachea, larynx, or bronchia; posterior part of lower lobe of left lung gorged with blood, also part of lower

lobe of right lung. On inflating the lungs the air would not enter these portions, but on cutting the latter blood flowed as from a liver. The blood which escaped into the thorax while examining lungs coagulated, while the mouth was being examined, during a period of about 20 minutes.

False membrane in both nostrils. There was not the least putrescence either in smell or appearance, nor was there scarcely the usual tendency to decomposition.

45. I saw a case in the practice of one of my friends, a boy eight or nine years old, who survived fifteen days. No autopsy. The day of death no marked tendency to putrefaction, of which some have spoken. The breath was bad but no worse than usual in fever, or when the mouth contains decaying substances.

In this latter case the false membrane so nearly oblitered both nostrils that the nasal aperture did not exceed the diameter of an ordinary pocket-case probe. The epiphora and coryza in both these cases were marked from the beginning. The same disposition to stretch the head back, so that a line drawn from the apex of the head to the point of the chin would be perpendicular to the axis of the body, was observed in both cases.

In both cases the purplish hue of the face was remarked some days before death.

46. From these two cases, *the proximate cause of death would appear to be poisoning by retained carbonic acid, or slow suffocation.* Hence the indication would be imperative to facilitate respiration, which might be achieved in three ways, which should perhaps be resorted to in the order mentioned:

1. Excision of the tonsils; one or both, according to Bouchut.

2. Tubing the larynx, after the manner of Dr. Green of New York, or of Bouchut of Paris.

3. Tracheotomy, according to the recommendations of M. Trouseau.

47. If the exudation does sometimes occupy the air passages, then all these operations would almost necessarily be unavailing. There are no doubt many cases, possibly a large majority of them, in which the larynx, etc. are not implicated, and in such cases the utility of one of these three modes of relieving impeded respiration, could hardly be doubted.

48. Oxygen gas should also be a good remedy in case these operations were not resorted to. I merely intimate, without presuming to instruct.

47. The day of the death of case I, another child in the same family, a girl eight years old, complained of headache, and her eyes looked dull and watery. She had some fever. A patch of false membrane appeared on the left tonsil: both tonsils were much enlarged. She had trifling coryza.

With hair pencil moistened in strong muriatic acid, I touched the patch of false membrane on the tonsil.

The respiration had a peculiar "woolly" sound, as it came through the nose. Ordered a saline purgative.

The next day there was false membrane in both tonsils and on the palate. Touched the patches with muriatic acid, being careful *not* to hit the parts not covered with exudation. Injected through the nose a strong solution of sulphate of copper, and ordered it repeated every two hours. This occasioned violent and prolonged sternutation. Diminished the strength of solution considerably.

Ordered extract of Lob. Infl. oz. ss, and Tart. Am. gr. ss, to be repeated in half an hour. Emesis was thorough.

The third day the breathing is clearer, and the exudation quite pale, but somewhat more extensive, is easily removed with the handle of a teaspoon in small portions.

No further treatment except injections of sulph. cupri. through the nose, and an emetic every day.

The 7th day. The disease is evidently exhausted. Where the syringe has

denuded the nares there is a thick pultaceous false membrane, but it has manifested no tendency to spread.

10th day. The fauces present a red and healthy appearance, Right tonsil much enlarged: left normal. There is still impeded nasal respiration. Throat to be gargled occasionally with solut. sulph. cupri.

15th day. The child seems entirely well.

50. This latter was no doubt a genuine case of diphtheritis, but still so mild a one, that very likely it would have recovered with domestic treatment only. The child doubtless took cold, and being constantly near the cradle of her little brother became contaminated with the morbific agent which generated in the predisposed system a sort of abortive diphtheritis to which nature had no design of yielding from the commencement.

I would here remark concerning cauterization, that in the first case the pellicle formed by cauterization, effectually masked the exudation, so that for two days it was impossible to discriminate the exudation in the cauterized portions; besides this it produced immense enlargement of the uvula, which no doubt further impeded respiration. Burning *infants* throats with solid caustic is not of *doubtful* propriety, but it is unquestionably bad practice. I speak of infants less than two years old. I am satisfied a well child can be killed in ten or fifteen days by burning the fauces daily with solid caustic. The organization in these little creatures is yet too delicate to resist such violence. The pain it occasions produces fever, the frantic crying exhausts the child, when all its vitality and as quiet a condition as possible are most needed. It is a mistake to suppose it does not hurt a child in affections of the throat, or the passages to it, to cry and shriek for half an hour. The minute vessels become so congested by these efforts that the disease is much increased in violence. An hour or more will be required after each paroxysm of crying before the impeded globules will again roll quietly on. For a beautiful illustration of the influence of irritation on the circulation in the capillary vessels, the reader is referred to the frog's web under the microscope.

I hardly know what to think of the pneumonia in the first case. There was no sign of it except the fever and rapid pulse. No cough, nor short breathing, nor moaning. The lungs were not examined critically, for it was not suspected that pneumonia or any other idiopathic disease, was coexisting with the obvious diphtheritis. The position in which the child was constantly kept, namely semi-recumbent, with its head hanging over the nurse's arm, or on its back in a cradle, would favor a stasis of fluids in the posterior and lower portion of the lungs. How much the solidification of the lung depended on this cause, and how much on active inflammation, or whether it did not result entirely from inflammation, of which the usual symptoms were masked by the more violent faucial affection and systemic malady, I am unable to form any positive opinion.

An infant, aged 1 month, in the same family, appeared unwell two or three days after the death of case 1st. On examining the mouth I found well developed muguet. This was very severe and persistent: extended quite through the alimentary canal and the exudation appeared and remained many days at the anus. The whole body finally became covered with minute pustules, at which time the affection of the mucous membrane began to subside. In about six weeks the infant appeared entirely well, but remained feeble a week later. It then had pneumonia, "head symptoms," violent tenesmus and colic, repeated convulsions, all of which it survived to the eighth day, on which it died in tetanic spasm. For the last 48 hours of life there was hardly an intermission in the convulsion; legs and arms were rigid most of the time, the head very hot.

It is well known that infants so young seldom have diphtheria; but I have thought that the unusually severe sprew in this case depended on the same morbific agent, and the fatal supervening affections were very much aided if

not excited, by the exhausted and poisoned condition in which the organism remained.

This last case does not strictly come under my subject, but I present it because it occurred so soon after the death of the other, and because it evidently has a family resemblance to diphtheria itself.

51. The microscopical examination of the false membrane in Case 1st, proved it to be an aplastic membrane, having none of the fibrinous and organizable characteristics of the exudation in croup. It is composed of epithelial scales, white globules—pus, mucous and colorless blood—amorphous masses. It contained abundance of *oidium albicans*, in every stage of germination, but they were certainly accidental formations, for pieces that contained none of the vegetation one night would present it in abundance the following night.

This harmonizes with the report of the Lancet Sanitary Commission. This report insists on this differential diagnosis: that in diphtheritis the exudation is *always* aplastic, non-organizable, while in croup the exudation is always fibrinous.

RECAPITULATION.

I. Diphtheria is a *specific* disease.

II. It is distinguished from scarlatina, by the absence of eruption; from gangrenous sore throat, by the absence of ulceration and sloughing; from croup, by the aplastic nature of the exudation.

III. Diphtheria may properly be divided into two varieties, (¶ 23) the mild and the severe.

IV. The mild is seldom fatal: slight, or no difficulty of deglutition, little fever, no engorgement of cervical glands, neither coryza nor lachrymation, but presenting the positive diagnostic sign of aplastic exudation on the tonsil, palate or pharynx.

V. The severe is recognized by the diagnostic aplastic false membrane, high fever at first, coryza, lachrymation, engorged glands about the jaw, difficult deglutition, difficult utterance, or complete aphonia, great diminution of animal power, cyanosis, vomiting towards the close of the affection (¶ 9. ¶ 23.) and intense gangrenous fetor from the decomposition of the exudation.

VI. Dipetheria is contagious.*

VII. The simple form is easily controlled by treatment which is the same as for the severe form, modified according to the comparative urgency of the case.

VIII. The severe form is with difficulty controlled, and the diagnosis is always extremely unfavorable, even at the beginning.

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* The experience of the French epidemics has made abundantly clear one very important fact in the history of diphtheria, which has not yet been so clearly eliminated from the observed facts of the English epidemic. It may be very clearly shown by the evidence collected that contagion plays the principal part in the propagation of diphtheria. There is in this country a great deal of scepticism as to the contagious character of this disease; but the mass of evidence to prove it is overwhelming. Thus Bretonneau has collected some crucial cases. One is that of M. Herpin, surgeon to the hospital at Tours and professor at the school. A child seized with diphtheria, who had transmitted the disease already to its nurse, was placed under his care; at one of his visits, by access of cough, part of the diphtheritic matter was ejected from the mouth while the process of sponging the pharynx was being performed, and it lodged on the aperture of the nostril of M. Herpin. Occupied with his task, he neglected for a moment to remove it. A severe diphtheritic inflammation of the part ensued, which spread over the whole nostril and pharynx. Extreme constitutional disturbance occurred, and the prostration was so severe that convalescence occupied more than six months. Dr. Gendron, of Chateau de Loire, received a shower of tracheal diphtheric exudations expelled by a young patient during an access of coughing. Laryngeal diphtheria set in with urgent symptoms. Prompt measures saved him.—*Lancet, April* '59, p. 288.

IX. The treatment is the local application of hydrochloric acid, diluted or not; solution of nitrate of silver, one or two scruples to the ounce of distilled water; strong solution of sulphate of copper, drachm and a half to the ounce of water; concentrated solution of the perchloride of iron; Monsel's Salt in powder; solution of chloride of sodium, etc, according to the educated judgment of the physician.

Externally—strict cleanliness; in the first stage of the disease, while the engorgement is red and hot, cold wet compresses applied to the neck and often repeated, can scarcely fail to relieve, at least for a time. Farther along when the engorgement of the throat becomes œdematous, warm fomentations should be substituted. Never linaments, mustard, nor anything of the kind, for these appliances increase the anguish of the patient and do not mitigate the affection.

Internally—first a thorough emetic of ipecacuana, given in full dose and largely diluted, so as to be vomited immediately. This should be repeated daily for the first two or three days. The bowels should be moved once a day by glysters, if possible, if not by some mild laxative. Drastic carthartics should be carefully avoided. Iced milk and water, or iced gum-water, or iced infusion of ulmus fulva, should be given in minute quantity, frequently, as the patients desire. These iced fluids will be found very grateful to them.

Quinine in small doses, say from one fifth to one-half a grain, often repeated, should materially assist in the tonic treatment universally recommended.* The mixture of "sesquichloride of iron with chlorate of potass, chloric ether, and hydrochloric acid sweetened with syrup," may be employed by those who fancy many not incompatible compounds in one conglomerate. But care must be used not to give this mixture with the milk and eggs recommended in the same paragraph of the Lancet's Commission, and yet it is hard to see how this could be avoided, if all are to be given "frequently." I would suggest another remedy combining tonic, nutriment and stimulus: ferruginated cod-liver-oil and brandy, in the proportion of two fluid drachms of the former to one of the latter, repeated 4 or 5 times a day, or oftener if the stomach will bear it.

I believe chlorate of potash harmless, but of unproved efficacy in diphtheria. I have employed it, but saw no results except mitigation of fœtor of expiration, when the false membrane was in the stage of decomposition. Charcoal, chloride of soda, etc., perhaps act in a similar manner. Ablation of the tonsils at the beginning of the disease, it appears to me, cannot be too strongly insisted upon. (¶ 10.) Tracheotomy cannot be ignored, but should be resorted to where other means fail to relieve the cyanosis, and suffocation is imminent from obstruction of the fauces and larynx, or even the fauces alone, the larynx being intact. In this latter condition, tubing the larynx should first be attempted.

It is less difficult to prevent this disease than to cure it. The most scrupulous cleanliness of person and surroundings, free and constant ventillation, should be insisted on. If there are many children and the rooms are small, as frequently happens in families where this disease appears, the well ones should be sent away if possible, and if not, kept out of the room in which the infected child lies. M. Duche insists on the free use of sulphur as a pro-

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* Of the many internal remedies which have been advised, we do not know of any on which so much reliance can be placed as on the tincture of sesquichloride of iron, with chlorate of potass, chloric ether, and hydrochloric acid, in the form of mixture, sweetened with syrup, full doses being employed according to the age of the patient, and frequently repeated. A free use should be made of generous wine, beef-tea, coffee, eggs in combination with brandy and wine, milk, and whatever other form of nutriment the ingenuity of the surgeon or the fancy of the patient can suggest. When food is refused, then enemata similarly composed must be administered frequently, in small quantities of two ounces and upwards, that they may not be rejected; for it is of the first importance that inanition should not open the last portals of life to the advancing disease.—*Lancet Commission.*

phylactic, he says those children who took sulphur were not attacked, in any case, while others under the same circumstances, fell victims to the malady. It is a simple harmless remedy, and should be tried as a preventive. M. Duche may be right.

Finally, all our knowledge of this disease may be thus epitomised.

1. Diphtheria is a specific new zymotic disease.
2. Its diagnostic sign is an aplastic membranous exudation.
3. The indications of treatment are to remove the exudation and prevent its re-formation.
4. The treatment is tonic, anti-septic, stimulant and nutritious.
5. The means of prevention, are cleanliness, pure air, free living, and possibly sulphur taken internally.

Conclusion.—Diphtheria is the most *certainly* fatal epidemic that ever visited our race; but it is not *de natura sua* incurable.

Congenital Asphyxia.

DIRECT INSUFFLATION—CASE.

Doubtless hundreds of children die annually during their advent into the world, or a very few moments after birth. This early death without any organic lesion, is seldom necessarily final; or to speak more clearly, it is a temporary death, if the child is restored, and perpetual if it is not. Yet the child that is born with the heart still is dead, and will stay dead if left to the care of nature only. If the heart is beating at birth, but from any cause whatever the infant does not breathe soon after pulsation ceases in the cord, or after the latter is divided, its heart will cease beating, and will not *sua sponte* resume its pulsations. I think it may be asserted without argument, and that it will be believed without proof, that if the heart of a new-born child ceases to beat for a single minute after the cord is divided before respiration has been established, that of itself it will never beat again, that spontaneously respiration will never begin, and hence that the infant in this condition is really dead.

Some pretend to say if respiration can be restored, and consequently the heart set in motion, the child has not been dead; but life has been merely suspended. Now this is subtlety without sense.

The circulation of the blood is essential to life. If the heart beats ever so little there is still some circulation and life, but if it stops the definition of life is imperfect, it is no longer life, but something else, and this something else is the absence of life which is death.

This is sometimes the first care of the physician. He is expected to *try* to restore life to the child; he is not expected to succeed by the friends after it is known the heart no longer beats, the cord being divided. But it is doubtless in most cases possible to restore the child, if the heart has not been so long still as to allow the blood to coagulate in the larger vessels and cavities of the heart itself. The period at which this should take place must constantly vary in different cases, in consequence of many conditions on which the fluidity of the blood depends, which conditions are not likely to be the same in two consecutive cases.

The causes of the child being born "still," when at the commencement of labor it was living, as ascertained by the usual certain signs, is not clearly understood.

It may occur if the labor is protracted, if the forceps is employed, and much and long continued traction has been requisite, or if after the head has passed the vulva much time elapses before the shoulders are delivered. This latter accident may happen in the best hands from lack of uterine contraction, from inability to get the finger in the child's axilla, or from pulling on the head of the child to perfect the delivery.

Why the child should be still-born, from even half an hour's compression and traction with forceps is not very clear.

The origin of the pneumogastric is scarcely affected by any compressing force ever exercised upon the head of the fœtus, and the sympathetic still less. But the constrictor vaginæ muscle, encircling the neck after the head has passed and the forceps have been removed, may cause apoplectic asphyxia. This tendency we constantly see, even in a natural labor, in the minute interval between the passage of the head and shoulders of the child. In this short period the face of the infant often becomes more or less colored. It is not easy to understand how labor, however prolonged, could cut off the circulation in the cord, unless the latter should happen to be resting upon some solid part of the fœtus, applied against a constantly contracting uterus, which could hardly occur. I am of course speaking of head presentations. If the feet present, still-birth is not difficult to be accounted for; tension and pressure being on the cord itself, the moment the navel of the child has passed the uterine orifice. In such cases, cessation of motion in the fœtal heart readily takes place, and is as readily accounted for.

But whatever may be the cause of asphyxia, the first indication is to restore the pulsation of the heart and respiration. If this can be done by the application of heat to the cord, or placing the child and cord in hot water, and by the employment of the "ready method" of Marshall Hall, to induce respiration, very well, the indication is accomplished; but if after a moment or two lost in these efforts, pulsation does not return, I would tie and divide the cord as quickly as possible, and having placed the infant in a convenient place, I would not waste time in slapping it in the face, or dashing cold water on it, or pouring brandy in its throat, which would most likely run into the trachea, nor in tickling the nose with spirits of ammonia, nor in any of the thousand vulgarities suggested by over officious assistants. If the asphyxia is nearly complete, the child will be insensible to all such manipulation: if total, it would be merely absurd.

After a few efforts by the "ready method," if I should not succeed, I would resort to artificial inflation of the lungs. This I would not attempt to accomplish by applying my mouth to that of the fœtus and blowing, for I should expect to have to inflate the alimentary apparatus before the air would pass into the trachea, and this every time I wished to inflate the lungs. It would be about as well to tightly close the mouth of the fœtus, and try the method made classic by the memorable suggestion of Cervantes, in one of his prefaces.

Neglecting all these indirect and uncertain processes, I would seize a gum elastic tube, the size of a No. 6 catheter, with a hole in the end instead of the sides, if I had it or could get it, and if not, any No. 6 catheter, or any other, not quite as large as the infant's trachea, (I mention a No. 6, because it is large enough; a much smaller one would do, perhaps equally well), and having caught the epiglotis cartillage with the nail of the index finger of the left hand, I would with the right, pass the tube into the larynx and trachea a couple of inches, and then withdrawing my left finger, inflate gradually the child's lungs. Before the expiration was completed, I should, expect to see the beating of the fœtal heart at the rate of one hundred and twenty times in a minute. I would then continue to press the air out of the chest, and inflate again and again, and after a few such efforts, I should expect to to see a spasmodic inspiration performed by the child itself, followed by the usual rattling expiration, which I should aid by pressure on the chest.

At first there may be only one of these inspirations per minute, for four or five minutes; then two, and finally six or eight, and in a bad case we may succeed in obtaining eighteen respirations a minute within an hour from the first inflation of the lungs. There may be no motion of the voluntary muscles till after the respirations become more frequent, and not the least sign of sensation. The catheter in the larynx causes no irritation, it would be a good sign if it should. But up to this time or later, there is complete anaesthesia. During all this period I would keep the child in a vessel of water as near blood heat as possible, not to secure the stimulating effect on the cutaneous surface of hot water, but to preserve the temperature of the little creature as it was in the womb of its mother. If the respirations were now tolerably uniform, that is, if they took place at nearly equal intervals, though even no more than eight or twelve to the minute, provided they occurred by aid of the inter-costal muscles, as they usually will by the time they have reached eight per minute, I would withdraw the catheter or tube, and depend upon slowly turning the child from side to back in the water, to sustain respiration and increase its frequency. If no accident occurs, in the course of two hours or a little less, respiration may be expected to become of natural frequency and smoothness, the pulse at the wrist of the usual strength and slight voluntary motions may be expected.

The first sign of the return of sensation, is the mobility of the pupils on raising and depressing the motionless eyelids. I think when this sign is observed, it may be expected that the tube will soon need to be removed from the trachea.

A very late author on diseases of women and children, Dr. Bedford, recommends the usual treatment. Insert the child in water at 50 degrees, then in the same fluid at 100. Inflate the lungs by applying the mouth to that of the fœtus, dashing water in the face, free current of air, etc. Not a word of direct inflation by the use of a tube.

Bedford, Davis, Mitchell, Condie, Churchill, Berton, Billard, and numberless other authors on diseases of children, say nothing of direct inflation of the lungs.

Bouchut, in his work on diseases of children, remarks, after he has been recommending cold and hot water, cold air, flaggelation on the buttocks, bleeding by leeches at the axillæ, and at the cord, when blood will flow from the latter, inflation by applying the mouth to the mouth of the child, and holding its nose: "Il pourait y en avoir si, prenant le tube laryngien, et dans le bout d'envoyer un air plus epure, dans le poumon, on voulait pratiquer cette insufflation avec un soufflet. C'est ainsi que, pour remedier a un accident deja fort grave, [that of inflating the lungs with air already once respired, as is done in case of inflation by mouth to mouth.] on en determine un autre qui est l' emphysme des poumons."

Bouchut suggests direct inflation of the lungs by means of a tube and bellows, but dreads emphysema, or rupture of the pulmonary vesicles. This accident would be much more likely to occur by employing bellows, than by applying the mouth to the tube. True, in the latter case the air conveyed to the fœtal lungs would not be so pure as if derived immediately from the atmosphere, but this defect would be more than compensated by the physician being able to control the amount of air blown in, and to appreciate the resistance to its entrance into the lungs, and thereby regulate the force of insufflation. Of course a physician of judgment would not exhaust his own lungs in inflating an infant's, but only blow into the tube sufficient to cause the fœtal thorax to dilate slightly. I cannot conceive how rupture of the vesicles should take place, if any degree of intelligent moderation in the force and quantity of the insufflation is employed. How authors can reconcile the application of three leeches to the axillæ, and the encouragement of the flow of blood from the unligated cord, even to syncope, with the low animal heat and slight ability of the new-born to generate animal warmth, and renew a loss of blood, is inconceivable to me.

They* say there is congestion where there is cyanosis; that is, pulmonary and cerebral apoplexia, and the flow of blood will relieve it. This latter is more easily asserted than proved. There either is or is not an abnormal quantity, that is too much blood in the circulatory apparatus. If there is not an abnormal quantity, evidently it is dangerous to abstract any. If there is too much how came it there? Did it keep flowing in through the umbilical arteries without being able to return to the placenta by the corresponding veins? This is not plausible, for the same causes that would arrest the return of blood from the fœtus, should also prevent its access to it.

Dr. Tyler Smith says the principal cause of congenital asphyxia is the want of a due supply of blood to the maternal side of the placenta, from continuous uterine contraction, or from partial or entire placental detachment, or continued pressure on the umbilical cord. Blood is not supplied, and the cord is compressed at the same time; hence the blood in the fœtus at the time compression begins, remains there in a state of partial or total stasis, not in diminished or excessive quantity, whatever Dr. King, (Lancet, 1859, p. 170.) may say about the suction of the placenta causing syncope, if respiration does not begin immediately after the child is born, or if the cord is not immediately tied to prevent the effect of the suction! If then the apoplectic asphyxia is merely a stasis of the blood from arrest of circulation, how will leeches at the axillæ, acting only on the capillaries, act on the great vessels and set the heart in motion? And if it is already in motion, how will the abstraction of blood by leeches set up respiration? Such a hope appears to have no rational basis. There is infinitely more rationality in spanking as proposed by Bouchut, for this, if it does not excite respiration, does not abstract the only medium of an already dubious vitality—blood. Dr. Tyler Smith, evidently doubted the propriety of abstracting blood, but was deterred by a laudable deference for the opinion of his predecessors, from absolutely proscribing it; hence he says if the child is *very back, a small* quantity of blood should be allowed to flow from the umbilicus, before tying. He recommends inflation by mouth to mouth, or through a tube inserted in the mouth or nostrils, (not carried into the larynx); last he recommends the trial of the method of Marshall Hall—"ready method."

Marshall Hall himself, with his characteristic rationality, entirely ignores bloodletting, either by the cord or leeches, in congenital asphyxia. He says in the stillborn it is impossible to decide except upon autopsy, whether there is meningial apoplexia with extravasation or not, and consequently the indication is always the same —to establish respiration as *soon as possible*. Then he goes on to say that respiration is an excited function, and is brought about through the medium of the *trifacial, spinal or pneumo-gastric* nerves, or all of them. Hence with necessary sequence, he proposes dashing cold water with *force* in the face, to excite the tri-facial, on the chest and back to excite the spinal, or for the same object to tickle the soles of the feet, irritate the thighs and legs in any manner, even by pricking with pins; he thinks the application of one pole of an electric machine to the mouth, and the other to the verge of the anus, should be a powerful means of exciting the pneumogastric. On the same principle stimulating mixtures are applied to the nasal and faucial lining. He says nothing of direct inflation by means of a tube in the trachea. He resorts to all the usual remedies except bleeding, and also of course would have employed his "ready method," upon occasion.

There occurs in the *Dic. de Med. Art.* "Asphixie," this very definite and concise notice of the origin of pulmonary insufflation. "In consequence of the experiments of Visale, and the suggestions of Godwin, (*The Connection of Life with Respiration; London*, 1788), pulmonary insufflation has long been employed. The first attempts were made by mouth to mouth; but afterwards the propriety of allowing respired air to be blown into the lungs of the asphyxiated individual was doubted; still later it was ascertained that only a *very small quantity* of air reached the lungs. Then the application of more exact means was advised. Chaussier proposed a copper tube called *tube laryngien*. After having placed the individual upon an inclined plain so that the head should be a little elevated, the tube was introduced into the larynx through the mouth or nasal fossæ; one assures himself by the aid of the finger that the tube has entered the orifice of the trachea; it is secured in this position, and to the mouth of the tube an ordinary bellows is adapted and insufflation of small quantities of air is accomplished by slight pressure on the bellows, being careful to perform it in an intermittent manner, imitating natural respiration. The elasticity of the lung is sufficient for the expulsion of the air. M. Leroy d'Etiolles, (Arch. gener de Med., t. xx p. 302.) demonstrated by a series of experiments, that the artificial distension of the lungs in sheep, caused rupture of the pulmonary vesicles, and fatal interstitial emphysema. MM. Magendie and Dumeril, reporters upon his memoir, also confirmed these facts, but showed that air impelled with a great deal of force

* Billard, Dewees, Mitchell, Bouchut, etc.

into the trachea of infants and of fetuses, would not cause rupture as in adults. These facts were moreover known to Hedle and Bichat, and the experiments of M. Leroy proved only that pulmonary insufflation should be moderate. M. Divergie regards its employment as extremely advantageous.

It will be perceived that though recognized and favorably considered by Chaussier, Magendie, Dumeril and Devergie, as a valuable means of resuscitation, the *oxygen tube* has fallen into disuse, which can clearly be traced to the memoir of Leroy d'Etoilles, on its employment causing rupture of the vesicle in sheep. And although Magendie and Dumeril denied the facility of rupturing the vesicles of foetuses and infants, still the profession have steadily ignored comments, and adhered to the first suggestions of danger, and we find in all later authors who speak of artificial inflation, the most careful warnings against this danger. Even Marshall Hall recommends covering the child's mouth with a *fold* of linen to prevent the two violent inflation of its lungs, and at the same time appreciating the liability of the air to enter the stomach instead of the lungs, he tells the physician to press the child's trachea against the oesophagus, to prevent the air taking that course. Inflation by the bellows must be objectionable, because of the inconvenience of having a bellows always at hand, the time lost in adapting it to the tube, and the inability to appreciate quantity and force, as when blowing from the mouth.

The principal objection to blowing from one's own mouth is, that the air blown out has already been once employed, and must consequently be vitiated. This is readily remedied by the physician making a few forcible and rapid respirations, for it has already been shown by the experiments of Faraday, that the expired air contains much more oxygen and less carbonic acid after a few such respirations, than during the usual respirations. This scarcely needed any experiments, for it is evident without reflection.

Having examined the modes of exciting respiration in congenital asphyxia, and there being the utmost harmony among authors as to the first and imperative indication, namely, to excite respiration as soon as possible, I submit that the means which will most certainly and speedily accomplish this is the best means, if it is not attended with a paramount danger. The danger of the direct insufflation we have examined and found comparatively small. Indeed, I apprehend it would be impossible to rupture the vesicles, if a tube is employed with a diameter considerably less than that of the trachea; for evidently as soon as there is any resistance to the further introduction of air by the distension of the lungs, it would find its way out by the sides of the tube, and through the mouth, which remains wide open, or even through the nares. One can inflate a bladder of the most delicate texture by means of a tube inserted into its neck, even though the tube does not fill the aperture of the bladder; but we cannot cause any appreciable distensive force on the bladder, because, from the mobility of the air and the patent orifice, it of course would escape into the ambient atmosphere, before it ruptured a vesicle of cobweb delicacy. For this reason I have recommended a small tube two or three lines in diameter.

In the *Gaz des Hôpitaux*, 1857, No. 136, will be found a concise, and not satisfactory case of tubing the larynx in congenital asphyxia. The case is by Delfrayssc, and was suggested to him by hearing of Bouchut's tubing the larynx in croup. But this is another thing from the mode I propose. Delfrayssc did not inflate the lungs through the tube, but excited the act of respiration by pressing on the child's thorax; this latter act, not the insertion of the tube, was followed by respiration; from which we would infer that the tube merely removed a mechanical obstacle, mucous spasm of the larynx, or something of the sort. After respiration began, he withdrew the tube by the thread which retained it, one end of which hung out of the mouth. With this exception, I have not read of any case in Europe or America, in which the tube and insufflation have been employed or recommended. Yet it precisely fulfils the indication on which all agree—the prompt establishment of respiration.

With the concise report of a single case, I close this paper.

Case. A woman had been in labor more than 24 hours. The head of the foetus would not engage in superior strait; presentation was occipito-posterior. Forceps applied above the superior strait. After one hour's traction without removing forceps, the child was extracted. Asphyxia was complete. The cord was pale and pulseless, the foetal heart was absolutely still. The child and cord were placed in hot water, but the cord not pulsating, it was divided before tying, when it emptied itself of the blood contained in the foetal portion, perhaps half an ounce; it was immediately grasped and tied. The child was then removed, and subjected to all the usual means of resuscitation, for at least ten minutes, without any result. The skin was cold, the under jaw relaxed, the whole body perfectly "limpsy." All present said it was dead. It did seem a hopeless case.

Inflation mouth to mouth was tried, by which the stomach was inflated but not the lungs, as was easily perceived by the absence of mucous rattle on pressing out the air. This sound is of course well marked when the air is pressed out of the foetal lungs. The foetus was thus repeatedly blown up without result.

A small gum-elastic catheter was now substituted. Two or three attempts at get-

ting it into the trachea failed, because it became so flexible in the heat of the hand and mouth as to be unmanageable. Another effort was made by the "ready method," but no respiration. Now the experimenter seized the epiglotis cartilage with finger nail, and gliding the limber catheter to that point, pressed its point into the laryngial orifice; it was then pushed down an inch or a little more, and the experimenter having first made two or three rapid respirations, applied his mouth to the end of the catheter and gradually inflated the lungs of the child. Here was a beautiful example of the effect of atmospheric air in setting the heart in motion. The child was naked, and the eye of the experimenter was fixed upon the portion of the thorax where the pulsation of the heart would be visible. The lungs were almost distended, when the tap, tap, tap, of the hidden little controller of life became visible in the inter-costal space. When the eyes of the "assistants" were directed to this little palpitating spot, they all uttered exclamations of surprise, and the joy of the mother and father at the restoration of their only child, was unbounded. They had considered it dead, had not expected it to be born alive, or with sufficient vitality to be resuscitated.

Not long since I was called to the bed of one in the prime of life, who was in the shadow of death. When I entered the room his respirations were twelve to the minute; each inspiration was semi-spasmodic, and the corresponding expiration was attended with the mucous death rattle. In a few moments the respirations were eight, then six, then three, then several of two to he minute, then three of one to the minute or minute and a half, violently spasmodic and abdominal, and the heart continuing to flutter and oscillate a moment longer, then subsided into eternal quiet. Reverse this picture and we have the gradations by which the dead foetus becomes the living child.

The lungs of this child were inflated about fifteen times per minute: about the expiration of one minute it had a spasmodic inspiration, and then there was the characteristic prolonged rattling expiration as the thorax gradually subsided. There was still no sign of sensation, nor the least motion of the voluntary muscles, the eyes closed and pupils motionless on lifting the lid. The catheter was left in the trachea about ten minutes, when the spasmodic respirations having reached four or six a minute, it was withdrawn, and respiration kept up by turning and raising or depressing the arms. Still purple lips, ears, nose and extremeties, capillaries of the upper eye-lids begin to look scarlet. Fifteen minutes after removing catheter there were eight spasmodic respirations per minute. A little more than one hour after delivery there were twelve respirations per minute; soon after eighteen, still spasmodic. At seven minutes past two o'clock, p. m., or one hour and fifty minutes after the child was delivered, respiration suddenly became of normal frequency, but more labored than in the healthy state. There were not, up to this time any muscular movements, except those concerned in respiration. Just at this time the eye-lids were lifted again, and the pupils were seen to be mobile for the first time; but there was still complete anæsthesia, verified by slapping the face with the corner of a cold wet towel, pinching the inside of the thighs, tickling the soles of the feet, etc., none of which were followed by the least sign of sensation. The lower jaw was still relaxed and drooping; the whole body still completely flaccid. Child now removed from the hot water and wrapped in dry hot flannels. It opens its eyes for the first time at a quarter before three, or about two hours and a quarter after delivery. It next moves its legs and arms feebly. Its eyes again close, no crying. In the evening it has convulsions. These occur at intervals without much violence, for two days, after which the child is apparently well. The child is now a month old, and in excellent health.

I leave this case without comment, satisfied that every physician of experience in obstetrics, will recognize it as belonging to that class of cases which hardly ever survive; the asphyxia having reached such a degree, that resuscitation seems almost incredible.

I would remark before leaving this subject finally, that during the preparation of this paper, I have repeatedly inflated the lungs of fetuses of four and six months, which have been some time preserved in alcohol, and I find myself utterly unable to rupture the vesicles by blowing through a tube two lines in diameter, inserted loosely in the trachea; the air after the lung is inflated rushes back by the sides of the tube as fast as I can blow it in. This corresponds with the report of Magendie and Dumeril, mentioned before, from all of which we may reasonably infer, that the danger of producing interstitial emphysema, by insufflation of the lungs of the new-born child in a state of asphyxia, is habitually exaggerated.

Conclusion. A most expeditious and eminently safe means of establishing respiration in congenital asphyxia, is direct insufflation through a tube smaller than the aperture of the larynx.

The insufflation is most readily and safely performed, by applying the mouth to the tube, after having made several rapid respirations for the purpose of purifying the expired air. This last precaution should be repeated from time to time, if the resuscitation is prolonged.